SPECIFICATIONS and CONTRACT DOCUMENTS
For

Kathryn Stagge-Marr Park Shelter

CLERMONT COUNTY PARK DISTRICT
CLERMONT COUNTY, OHIO

BOARD OF PARK COMMISSIONERS
John Stowell
Andrew McAfee
David Anspach

Date: August 2, 2023

EXECUTIVE DIRECTOR
CLERMONT COUNTY PARK DISTRICT
Josh Torbeck

CLERMONT COUNTY PARK DISTRICT

2156 US HWY 50
Batavia, Ohio 45103
(513) 732-2977

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ADVERTISEMENT FOR BIDS

Separate sealed bids for the construction of the following **Kathryn Stagge-Marr Park Shelter** within the **Clermont County Park District** will be received by the **Board of Park Commissioners of the Clermont County Park District, 2156 US HWY 50 Batavia, Ohio 45103**, until **3:00 PM** Local Time on **September 8, 2023** and then at said office publicly opened and read aloud.

Kathryn Stagge-Marr Park Shelter

Work under this Project is generally defined as: Construction of a park shelter and site work. The Owner expects to proceed with the construction under the Project immediately after satisfactory acceptance and award of the construction bid and execution of the contract, with completion of all work within 240 calendar days from the date of the Notice to Proceed. The Engineer's Estimate for this Project is $225,000

The information for Bidders, Form of Bid, Form of Contract, Plans, and Specifications including Forms of Bid Bond, Performance-Payment Bond, and other Contractor Documents may be examined at the following Locations:

Clermont County Park District
2156 US HWY 50
Batavia, Ohio 45103
(513) 732-2977

Woolpert Inc
1203 Walnut Street Second Floor
Cincinnati, Ohio 45202
(513) 527-2628 (513) 939-9027
Contact: James Dobrozsi

Copies of the Plans and Specifications, etc., may be obtained during normal business hours at American Reprographics Company (ARC), 4219 Malsbary Rd, Cincinnati, OH 45242, phone number 1-513-326-2300, upon payment of approximately $135.00. Or electronic versions of the drawings are available the Park District's web site at https://www.clermontparks.org/news/

All questions related to this project shall be provided in writing through email to the following:

Woolpert, Inc.
James Dobrozsi, AIA, PMP
james.dobrozsi@woolpert.com
1203 Walnut Street, Second Floor
Cincinnati, Ohio 45202
513-939-9027 (M) 513-527-2628

This notice is also posted on the contracting authority's website site at the following URL link: www.clermontparks.org. In order to view the legal notice, click on the News Link located on the Clermont County Park District home page.

Clermont County Park District Board of Park Commissioners:

John Stowell, Chairman

Andrew McAfee

David Anspach,

GENERAL INSTRUCTIONS TO BIDDERS
FOR PUBLIC IMPROVEMENTS
CLERMONT COUNTY, OHIO

Item Bid: **Kathryn Stagge-Marr Park Shelter**

Bid Opening Date: September 8th at 3:00 PM local time.

All bids submitted for consideration by the Board of Park Commissioners must comply with these instructions in order to be considered. These instructions set forth minimum requirements as terms and conditions of the public improvement. Therefore, if any time frames, bid bond or other surety requirements set forth herein are in conflict with stated requirements in the specifications, the specification requirements shall prevail.

1. Bids shall be submitted in a sealed envelope marked accordingly with item(s) bid on and name of bidder and delivered in compliance with the Legal Notice. Any improperly marked bid will not be considered.

2. All bids must comply with the specifications attached hereto. Alternative bids may be considered only if clearly marked as such with an explanation as to how the item is sufficient to meet required needs.

3. All prices, quantities, etc. as bid must be firm for a period of 60 days from the date of the bid opening.

4. Each person bidding for a contract for the construction, demolition, alteration, repair, or reconstruction of any public improvement is required to file with his bid a bid guaranty in the form of either (1) a bond for the full amount of the bid or (2) a certified check, cashier's check, or letter of credit pursuant to Chapter 1305 of the Revised Code in an amount equal to ten percent of the bid pursuant to Section 153.54 of the Ohio Revised Code. The successful bidder at the time he enters into the contract shall be required to file a performance bond in the full amount of the contract pursuant to Section 153.54 (C) of the Ohio Revised Code. Letters of credit and bid bonds must be filed with original signatures. Facsimile and electronic copies of the letter of credit, bid bond and Power of Attorney of the Surety will be deemed non-responsive.

5. When analyzing the bids submitted, superior design, technology, workmanship, materials, size of component parts, operating cost, warranty, service facility etc. will be considered in addition to price. It is Clermont County Park District's intent to accept the bid for which a thorough analysis of the bids submitted proves to be the most suitable for the intended use.

6. Unless otherwise specified, all material shall be new and of the best grade in its particular line and all articles shall be complete and in first class condition. All work shall be done in the best and most skilled manner, exactly as specified or detailed, and shall be subject to the approval of Clermont County Park District Officials. When required in the specifications, bidders shall make available for inspection a sample or similar model of the bid item prior to the award of the bid.

7. Reference to a particular trade name, manufacturer's catalog or model number is made for descriptive purposes to guide the bidder in interpreting the requirements of the Park District. They should not be construed as excluding proposals on other types of materials, equipment, and supplies. However, the bidder, if awarded a contract, will be required to furnish the particular item referred to in the specifications or description unless a departure or substitution is clearly noted and described in the bid proposal.

8. All bidders are required to submit the following affidavits with their bid proposal and the successful bidder will be required to enter into a written contract with Clermont County Park District within ten (10) days of the notification of award thereof:

    a. Non-Collusion Affidavit
    b. Affidavit Affirming Compliance with 9.24 & 5719.042 ORC

    These affidavits and specifications heretofore referenced shall be incorporated into and become a part of the contract document.

9. Every effort shall be made by the bidder awarded the contract to deliver items by or before the time designated in the contract. Any delinquency in such delivery without satisfactory written explanation directed to the Clermont County Park District may result in cancellation of the contract and substitution of other goods. The defaulting bidder shall be liable for any increased costs or expenses incurred as a result of such default.

10. In case of default by the bidder or contractor, Clermont County Park District may procure the articles or service from other sources without further advertising and shall hold the bidder or contractor responsible for any excess costs occasioned thereby, including any reasonable expenses incurred in procuring the articles or services.

11. Clermont County Park District is exempt from payment of Federal Excise Tax, Transportation Tax, and Ohio State Tax. Prices shall not include these taxes.

12. The Board of Park Commissioners reserves the right to waive any informalities, to reject any or all bids, to accept any bid which may be deemed to be for the best interest of the Clermont

County Park District and to hold such bids for a period of sixty days before taking any action thereon.

13. The Board of Park Commissioners further reserves the right to conduct such investigations and meetings as it deems necessary after receipt of bids to assist in the evaluation of any bid and to establish the responsibility, qualifications, and financial ability of the bidders, proposed sub-contractors, and other persons and organizations to do the work in accordance with the contract documents to the Clermont County Park District's satisfaction within the prescribed time limits.

14. Contractor hereby agrees to indemnify and hold the Clermont County Park District harmless from any claims, demands or losses of any type or nature to any person, bidder or corporation arising in any manner from the contractor's performance or failure to perform the work required under this contract and shall pay any judgment or liability obtained or growing out of said claims, liabilities or judgments, including reasonable attorney's fees and costs.

15. All materials and exhibits submitted in the bid response shall become the property of Clermont County Park District and will not be returned to the bidder. All bids received constitute public information as a matter of statutory law and will be made available for public inspection and copying upon request by members of the public pursuant to the requirements of Section 149.43 of the Ohio Revised Code. Any portion of the bid that the bidder requires to be treated as confidential in nature must be marked to that effect and provided that the information falls within an appropriate exemption enumerated under Section 149.43 of the Ohio Revised Code, that portion will not be considered public record. **A blanket indication of confidentiality or privilege will not be accepted and unless specific materials that fall within the appropriate statutory exemption are identified, the entire bid response will be treated as public record.**

INFORMATION AND INSTRUCTIONS FOR BIDDERS

1. Receipt and Opening of Bids

The Clermont County Park District Board of Park Commissioners, (herein called the "Owner"), invites bids on the forms attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the office of the Park District until 3:00 PM local time on September 8, 2023 and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, bearing on the outside of the envelope the name of the Bidder, address, and the name of the Project: **Kathryn Stagge-Marr Park Shelter.** The sealed envelopes shall be addressed to the Clermont County Park District Park Commissioners at 2156 US HWY 50, Batavia, Ohio 45103. If forwarded by mail, the sealed envelope containing the bid shall be enclosed in a separate envelope addressed as specified above.

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid for a period of 60 days after the actual date of the opening thereof.

2. Preparation of Bid

Each bid must be submitted on the prescribed Bid Proposal form on pages A-13, A-14, A-15, and A-16. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures. The total amount of the bid shall also be transcribed to the Bid Proposal Recap Form on page A-12. If a discrepancy or inconsistency is discovered between the Bid Proposal Recap Form on page A-12 and the original bid form on pages A-13, A-14, A-15, and A-16, the original bid form on pages A-13, A-14, A-15, and A-16 shall govern.

3. Pre-Bid Meeting

A Non-Mandatory Pre-Bid Meeting will be held, at 3:00 PM local time on August 24, 2023 at Kathryn Stagge-Marr Park, 6662 Goshen Road, Batavia, Ohio 45122.

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4. Subcontract

The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this contract must be acceptable to the Owner and/or his Representative. The bidder awarded the contract shall execute the Subcontract Form developed by the Ohio Department of Administrative Services with each Subcontractor in accordance with Section 153:1-3-02 of the Ohio Administrative Code. The Subcontract Form shall incorporate these General Instructions/Specifications into the Subcontract as if fully written therein.

6. Method of Bidding

The Owner invites the following bid:

Kathryn Stagge-Marr Park Shelter

7. Qualifications of Bidder

The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.

8. Bid Security

Each bidder is required, pursuant with Ohio Revised Code Section 153.54, to file with his bid a bid guaranty in the form of either:

7.1 A bond, for the full amount of the bid, prepared on the form provided herein and duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner. The Surety on such bond shall be a duly authorized surety company satisfactory to the Owner and Bidder must supply Certificate stating that Surety executing the Bond is authorized to do business in the State of Ohio.

7.2 A certified check, cashier's check, or letter of credit pursuant to Chapter 1305 of the Ohio Revised Code. Any such letter of credit shall be revocable only at the option of the beneficiary state, political subdivision, district, institution, or agency. The amount of the certified check, cashier's check, or letter of credit shall be equal to ten percent (10%) of the bid.

Bid security filed pursuant with this Section shall be returned to all unsuccessful bidders immediately after the contract is executed, or if no award has been made within the 60 days after the date of opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid or extended the bid. The guaranty filed pursuant to this section shall be returned to the successful bidder upon filing of the bond required under Item 12 of this Section.

9. Liquidated Damages for Failure to Enter into Contract

The successful bidder, upon his failure or refusal to execute and deliver the contract and bonds required within ten (10) days after he has received notice of the acceptance of his bid, shall forfeit the bid bond or security as provided in Chapter 153 of the Ohio Revised Code.

10. Time of Completion

Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete this Contract within 150 consecutive calendar days thereafter.

11. Conditions of Work

Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of his contract. Insofar as possible the contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of, or interference with, the work of any other contractor; the Owner or his representatives, or services to private property.

12. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications, or other pre-bid documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to Woolpert Inc., and to be given consideration must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail and/or by facsimile with return receipt request to all prospective bidders and/or return facsimile (at the respective address and/or facsimile number furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents.

13. Security for Faithful Performance

If the Contractor has furnished a cashier's check, letter of credit, or certified check as bid security, he shall furnish a surety bond or bonds in the amount of 100% of the bid simultaneously with his delivery of the executed contract, as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein.

If the Contractor has furnished a combination bid guaranty and contract bond, this bond shall become the security for faithful performance of this Contract and for payment of all persons performing labor on the project under this contract and for furnishing materials in connection with the Contract.

The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner and Bidder must supply Certificate stating that Surety executing the Bond is authorized to do business in the State of Ohio.

5. Power of Attorney

Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

6. Laws and Regulations

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

7. Obligation of Bidder

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect of his bid.

8. Non-Collusion Affidavit

The bidder shall execute the Non-Collusion Affidavit included in the specifications and submit with the bid proposal.

9. Affidavit in Compliance With ORC Sections 9.24 & 5719.042

The Bidder shall execute an Affidavit affirming compliance with Sections 9.24 & 5719.042 of the Ohio Revised Code. Such Affidavit requires a statement with respect to the personal property taxes on the general tax list of personal property of Clermont County, Ohio. Affidavit form to be executed is included in the specifications and must be submitted with bid.

10. Corporate and Out-of-County Bidders

All successful bidders who are corporate bodies shall furnish, at the time of execution for the contract, a resolution of the directors of the corporation, bearing the seal of the corporation, evidencing authority of the officer signing the contract to do so; likewise, agents of bonding companies shall furnish power of attorney, bearing seal of the company, evidencing such agents' authority to execute the particular type of bond to be furnished. A copy of these proofs shall be attached to each copy of the contract.

Particular attention is called to the statutory requirements of the State of Ohio relative to licensing of corporations organized under the laws of any other state.

14. Workers' Compensation

The Contractor shall furnish official certificate, receipt, or other satisfactory evidence showing that he has paid the Ohio State Industrial Insurance Premium required under the Ohio State Workers' Compensation Act and shall be at all times during the life of the contract covered herein, keep such insurance in full force and effect.

Workers' compensation insurance must be provided for every person employed on the project whether or not the insurance is required by the Ohio Law.

15. Non-Discrimination Provisions

The Contractor to whom the contract is awarded shall comply fully with the provisions of Section 153.59 and Section 153.60, Ohio Revised Code, relative to non-discrimination.

16. Contract Execution

The party to whom the contract is awarded will be required to execute the agreement and obtain the performance bond and payment bond 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 Agreement and bond forms. In case of failure of the Bidder to execute the Agreement, the Owner may at his option consider the Bidder in default, in which case the Bid Bond accompanying the proposal shall become the property of the Owner.

17. Commencement of Work

The Contractor shall not commence work under this contract until he has obtained all insurance required and such insurance has been approved by the Clermont County Park District, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required for coverage of subcontractor has been so obtained and approved.

18. Prevailing Wage Schedule

The Contractor shall post at conspicuous points on the site of the project a schedule showing all determined minimum wage rates and all authorized deductions, from unpaid wages actually earned. Updates to the wage rate schedule issued for this contract will be forwarded to the Contractor for posting and distribution to subcontractors.

19. Right to Withhold Payment

The Clermont County Park District reserves the right to withhold a sufficient amount from any payment due to the Contractor to cover (a) payments that may be past due and payable for just claims for labor or materials furnished in and about the performance of the work on the project under this contract: (b) for defective work not remedied, and (c) for failure of the Contractor to make proper payments to his subcontractor.

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BID PROPOSAL PACKAGE

*The bid proposal for **Kathryn Stagge-Marr Park Shelter** must be completed and submitted on the required forms as listed under **"Bid Proposal Package".***

1) BID PROPOSAL:
Six (6) pages supplied by Clermont County Park District including: Bid Proposal Recap Form and Bid Proposal.

2) BID SECURITY OR GUARANTY (separately for each contract bid):
   A. Bid Guaranty and Contract Bond: (two (2) pages supplied by Clermont County Park District), and effectively dated Power of Attorney (supplied by Bidder).

   B. Surety Certificate: (to be supplied by Bidder)

   C. Bid Guaranty: (one (1) page supplied by Clermont County Park District and certified check, cashier's check, or letter of credit (supplied by Bidder), in lieu of Bid Bond and Surety Certificate).

3) NON-COLLUSION AFFIDAVIT:
One (1) page supplied by Clermont County Park District.

4) AFFIDAVIT AFFIRMING COMPLIANCE WITH SECTIONS 9.24 & 5719.042 OF THE OHIO REVISED CODE (PERSONAL PROPERTY TAXES):
One (1) page supplied by Clermont County Park District.

5) EXPERIENCE STATEMENT:
One (1) page supplied by Clermont County Park District.

6) SUBSTITUTION SHEET:
One (1) page supplied by Clermont County Park District.

7) LIST OF SUBCONTRACTORS:
One (1) page supplied by Clermont County Park District.

BID PROPOSAL RECAP FORM

Kathryn Stagge-Marr Park Shelter

Bidder Information:

Bidder Name:_____

Address:

_____

_____

Addenda Receipt Acknowledgement:

Addenda:_____ Date Received:

Addenda:_____ Date Received:

Addenda: Date Received:

Bid Security:

(Check & Complete the Appropriate Section)

1. __ Bid Guaranty & Contract Bond

Surety Company: _____

Address:

_____

_____

2. __ Bid Guaranty - Check, Letter Of Credit

Amount $

Contract(s) Bid:

Bid Amount: $

All Information provided on this form is believed to be accurate and consistent with the information provided on pages A-13 through A-16 of these specifications. The information provided is for the convenience of the Clermont County Board of Commissioners and will be read aloud at the bid opening. This form and all information contained herein is **NOT** intended to take the place of any information contained in the Bid Proposal Package as described on page A-11. Should any inconsistent information be provided, the information on pages A-13 through A-16 shall govern and any discrepancy hereon shall not be cause for rejection of bid.

_____

Bidder

_____

Title

_____

Date

BID PROPOSAL

Place: _____

Date: _____

Proposal of _____ ,
(Insert Bidder's Name)

(hereinafter called *"Bidder"*) A_____
(Insert either Corporation, a partnership, or an individual)

organized and existing under the laws of the State of

doing business as _____.
(Insert Business or Company Name)

TO: The Board of Park Commissioners, Clermont County Park District, (hereinafter called *"Owner"*)

Gentlemen:

The Bidder, in compliance with your advertisement for bids for the installation of:

Kathryn Stagge-Marr Park Shelter

having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete Kathryn Stagge-Marr Park Shelter within 150 consecutive calendar days thereafter.

Bidder hereby acknowledges receipt of the following addenda:

Kathryn Stagge-Marr Park Shelter

Addendum No. Date

Addendum No.Date

Addendum No. Date

	SCHEDULE OF VALUES – Kathryn Stagge-Marr Park Shelter							
ITEM No.		DESCRIPTION	UNIT	# OF UNITS (U)	MATERIAL COSTS (M)	LABOR COSTS (L)	UNIT COST (M+L)	TOTAL COST U x (M+L)
1		Site Work and Site Utilities	EACH	1				
2		Building Foundation and Structure	EACH	1				
3		Exterior and Interior Finishes	EACH	1				
4								
5								
6								
7								
8								
9								
10								
11								
29								
TOTAL PROJECT BID: $								

Note: The unit cost is the sum of the material costs and labor costs. The total cost is the unit cost multiplied by the number of units.

ALTERNATE BID ITEM #1

No Alternates are requested

Summation of Bid Items

Total Base Bid in Figures $ _

Total Base Bid in Words: _____

Total Alternate Bid Item#1 in Figures $

Total Alternate Bid Item #1 in Words:

Amount of Bid to be shown in both figures and words. In case of discrepancy, the amount tabulated from the unit prices shall govern.

Bidder agrees to complete Kathryn Stagge-Marr Park Shelter described in the specifications and shown on the plans for the unit price amounts as submitted herewith.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, Bidder will execute the formal contract attached within ten (10) days and deliver a Surety Bond or Bonds as required by the General Conditions. (The bid must be signed by the proprietor if the bidder is a sole proprietorship, partner if the bidder is a partnership, or president or vice-president if the bidder is a corporation. If bid is signed by any other individual, the bidder must provide written documentation that the individual signing the bid has the authority to do so on behalf of the bidder.)

Respectfully submitted;

(Bidder)

_____

By:

(Title)

_____

(Address)

_____

_____

BID GUARANTY AND CONTRACT BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,

(Here insert full name or legal title of Contractor)

as Principal and

(Here insert full name or legal title of Surety)

as Surety, are hereby held and firmly bound unto the **Board of Park Commissioners of the Clermont County Park District** hereinafter called the Obligee, in the penal sum of the dollar amount of the bid submitted by the Principal to the Obligee on (Date)_____to undertake the project known as:

Kathryn Stagge-Marr Park Shelter

The penal sum referred to herein shall be the dollar amount of the Principal's Bid to the Obligee, incorporating any additive or deductive alternate proposals made by the Principal on the date referred to above to the Obligee, which are accepted by the Obligee. In no case shall the penal sum exceed the amount of

_____dollars ($_____).

If the above line is left blank, the penal sum will be the full amount of the Principal's Bid, including alternates. Alternatively, if completed, the amount stated must not be less than the full amount of Bid, including alternates, in dollars and cents. A percentage is not acceptable.

For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above-named Principal has submitted a bond on the above referred project;

NOW, THEREFORE, if the Obligee accepts the bid of the Principal and the Principal fails to enter into a proper contract in accordance with the plans, details, specifications, contract documents, and bills of material; and in the event the Principal pays to the Obligee the difference not to exceed ten percent of the penalty hereto between the amount specified in the bid and such larger amount for which the Obligee may in good faith contract with the next lower bidder to perform the work covered by the bid; or in event the Obligee does not award the contract to the next lower bidder and resubmits the project for bidding, the Principal will pay the Obligee the difference, not to exceed ten percent of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission, of printing new contract documents, required advertising and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect.

If the Obligee accepts the bid of the Principal and the Principal, within ten days after the awarding of the contract, enters into a proper contract in accordance with the bid, plans, details, specifications, and bills of material, which said contract is made a part of this bond the same as though set forth herein; and if the said Principal shall well and faithfully perform each and every condition of such contract; and indemnify the Obligee against all damage suffered by failure to perform such contract according to the provisions thereof and in accordance with the plans, details, specifications, and bills of material therefore; and shall pay all lawful claims of subcontractors, materialman, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for benefit of any materialman or laborer having just claim, as well as for the Obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunto shall in no event exceed the penal amount of this obligation as herein stated.

The said Surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of said contract or in or to the plans and specifications therefore shall in any way affect the obligations of said Surety on this bond, and it does hereby waive notice of any such modifications, omissions or additions to the terms of the contract or to the work or to the specifications.

SIGNED AND SEALED this _____ day of _____ , 20 .

Principal: By: Title: Address: Surety: Witness: Attorney-in-Fact: Surety Company

Address: Surety Agent's Name and Address:

BID GUARANTY - CHECK, LETTER OF CREDIT

When a Certified Check, Cashier's Check or Letter of Credit is deposited in lieu of a Bid Guaranty Bond, fill out the following:

The undersigned "Bidder" does hereby deposit with the "Owner" a (Certified Check/Cashier's Check/Letter of Credit) drawn on the _____ , whose address is _____, in the sum of _____

($) dollars

(not less than 10% of bid) to guaranty that if the bid submitted is accepted, the Bidder shall execute and deliver to the Owner a Contract and Performance Bond in accordance with the Bid Documents.

Bidder:_____

By:_____

Title:_____

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

STATE OF

SS:

COUNTY OF

_____, being first duly sworn, deposes and says that:

1) He is _____ of _____
(Owner, Partner, Officer, Representative or Agent) (Company)

the Bidder that has submitted the attached Bid:

2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid:

3) Such Bid is genuine and is not a collusive or sham Bid:

4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this Affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm, or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder or to fix any overhead, profit or cost element of the Bid price or Bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Board of Park Commissioners of the Clermont County Park District or any person interested in the proposed Contract: and

5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this Affiant.

Signature:

Title:

Subscribed and sworn before me this _____ day of _____, 20_____

Notary Public ,

Printed Name of Notary: _____

My Commission expires .

AFFIDAVIT IN COMPLIANCE WITH SECTIONS 9.24 AND 5719.042 OF THE OHIO REVISED CODE

STATE OF_____

SS:

COUNTY OF_____

Personally appeared before me the undersigned, a bidder in a competitive bidding

for _____
(Name of Firm)

for a _____ contract let by the Clermont County Park District, who, being
(Type of Product or Service)

duly cautioned and sworn, makes the following statement with respect to the personal property taxes on the general tax list of personal property of Clermont County, Ohio:

1. That the undersigned at the time of making this bid on the aforementioned contract was not charged with any delinquent personal property taxes on the general tax list of personal property of Clermont County.

2. That this statement is made in compliance with Section 5719.042 to be incorporated into the contract between the parties as provided in that Section of the Ohio Revised Code.

3. That pursuant to Section 9.24 of the Ohio Revised Code, if the project for which this bid is submitted has been identified as being funded in whole or in part with funds from the State of Ohio, the affiant further certifies that the bidder, if an individual, or if a corporation, any principal owning more than 10% equitable interest in the corporation, does not have a finding for recovery issued by the Auditor of State which remains unresolved as defined in Section 9.24 ORC.

Signature:

Title:

Subscribed and sworn before me this _____ day of_____, 20_____

Notary Public _____ ,

Printed Name of Notary:_____

My Commission expires _____ .

EXPERIENCE STATEMENT

The Bidder is required to state in detail, in the space provided below, what work of a character similar to that included in the proposed contract he has done, to give reference and such other detailed information as will enable the Owner to judge of his responsibility, experience, skill, and financial standing. Among other things, this statement shall include the following: evidence to the effect that the Bidder maintains a permanent place of business; has adequate construction facilities and equipment available for the work under the proposed contract; evidence to the effect that the bidder has a suitable financial status to meet obligations incidental to the work; evidence to the effect that the Bidder has appropriate technical experience and has in his employ a sufficient number of skilled and trained workmen to carry to completion, within the contract time, the work to be done under this contract.

SUBSTITUTION SHEET

All Bids must be based on the "Standards" specified. Bidder is to list here any "Substitutions" for which consideration is desired, showing the addition or reduction in price to be made, for each, if the substitution is accepted, or stating "No Change in Price", if none is proposed.

BRAND OR MAKE SPECIFIED	PROPOSED SUBSTITUTION	ADD	DEDUCT	NO CHANGE

It is understood and agreed that the proposal submitted is based on furnishing "Standards" as specified and entitles the Owner to require that such named materials and methods be incorporated in the work, except as Substitutions, if they are accepted, based on the quotations entered above, are subsequently made a part of the written contract.

Signed:

Title:

LIST OF SUBCONTRACTORS

PROJECT: Kathryn Stagge-Marr Park Shelter

Clermont County Park District

To:

_____

List Subcontractors and others proposed to be employed on the above Project as required by the bidding documents. (To be filled out by the Contractor and returned to the Owner). The bidder awarded the contract shall execute the Subcontract Form with each Subcontractor in accordance with Section 153:1-302 of the Ohio Administrative Code.

Work	Firm	Address	Phone	Representative

Document 00 52 14 - State of Ohio Subcontract Form
State of Ohio Standard Requirements for Public Facility Construction

This Agreement is made as of the date set forth below between the Contractor and the Subcontractor in connection with the Project.

Project Number:	**«insert number»**
Project Name:	**«insert name»**
Site Address:	«insert street address» «insert city, county»
Contractor:	**«insert name»**
Contractor's Principal Contact:	«insert name»
Address:	«insert street address» «insert city, state zip code»
Subcontractor:	**«insert name»**
Subcontractor's Principal Contact:	«insert name»
Address:	«insert street address» «insert city, state zip code»
Public Authority:	**«insert name»**
Public Authority Contact:	«insert name»
Address:	«insert street address» «insert city, state zip code»

ARTICLE 1 - NATURE OF SUBCONTRACT

1.1 The Subcontractor shall perform the entire Subcontract Work as specified in Exhibit «N» and described in the Contract Documents for the Project.

ARTICLE 2 - COMPENSATION

2.1 The Contractor agrees to pay for the performance of this Subcontract, subject to additions and deductions as provided in the Contract Documents, the Subcontract Sum of «insert Subcontract Sum», comprised of the following:

«insert Subcontract Sum component»..... $«insert amount»

«insert Subcontract Sum component»..... $«insert amount»

«insert Subcontract Sum component»..... $«insert amount»

«insert Subcontract Sum component»..... $«insert amount»

ARTICLE 3 - TIME OF PERFORMANCE

3.1 Time is of the essence. The Subcontractor shall diligently prosecute and complete all Subcontract Work in accordance with the construction progress schedule agreed between the parties.

ARTICLE 4 - CONTRACT DOCUMENTS

4.1 To the extent that the contract between the Public Authority and the Contractor applies to the Subcontract Work:

4.1.1 The Contractor and the Subcontractor agree to be mutually bound by the terms of the Contract Documents;

4.1.2 The Contractor assumes toward the Subcontractor the rights, remedies, obligations, and responsibilities that the Public Authority has and assumes toward the Contractor;

4.1.3 The Subcontractor assumes toward the Contractor the rights, remedies, obligations, and responsibilities that the Contractor assumes toward the Public Authority; and

4.1.4 The Subcontractor agrees to perform its portion of the Work in accordance with the Contract Documents.

4.2 The Subcontract and any modifications, amendments, or alterations thereto shall be governed, construed, and enforced by and under the laws of the State of Ohio.

4.3 If any term or provision of the Subcontract, or the application thereof to any Person or circumstance, is finally determined, to be invalid or unenforceable by a court of competent jurisdiction, the remainder of the Subcontract or the application of such term or provision to other Persons or circumstances, shall not be affected thereby, and each term and provision of the Subcontract shall be valid and enforced to the fullest extent permitted by law.

4.4 The Subcontract shall be binding on the Contractor and Subcontractor, their successors and assigns, in respect to all respective covenants and obligations contained in the Contract Documents, but the Subcontractor may not assign the Subcontract without the prior written consent of the Contractor and the Public Authority.

ARTICLE 5 - EFFECTIVENESS

5.1 The Subcontract shall become binding and effective upon execution by the Contractor.

5.2 This Subcontract has been executed in several counterparts, each of which shall constitute a complete original Subcontract, which may be introduced in evidence or used for any other purpose without production of any other counterparts.

5.3 Any signatory may deliver a copy of its counterpart signature page to this Subcontract via fax or e-mail. Each signatory shall be entitled to rely upon a signature of any other signatory delivered in such a manner as if such signature were an original.

ARTICLE 6 - REPRESENTATIONS

6.1 Contingent Assignment. The Contractor's contingent assignment of this Subcontract to the Public Authority, as provided in the Contract, is effective after termination of the Contractor by the Public Authority and the Public Authority's acceptance of the assignment in writing to the Subcontractor. The Subcontractor consents to the assignment and shall be bound at the same price and terms as in the Subcontract to the Public Authority. Unless the Public Authority takes assignment of the Subcontract, the Subcontractor will not have any contractual rights against the Public Authority.

6.2 Intended Third-Party Beneficiary. The Public Authority is an intended third party beneficiary of the Subcontract, entitled to enforce any rights thereunder for its benefit.

6.3 Insurance. The Subcontractor shall maintain insurance in accordance with the Contract Documents. Exhibit «N» sets forth the minimum limits of liability for the insurance required in the Contract Documents.

6.4 Right to Audit. The Subcontractor agrees that the Public Authority or any agents designated by the Public Authority have access to and the right to audit and the right to copy at the Public Authority's cost all of the Subcontractor's books, records, contracts, correspondence, instructions, drawings, receipts, vouchers, purchase orders, and memoranda relating to the Work for a period of not less than 3 years following completion of the Work consistent with Ohio Revised Code ("ORC") Section 149.43 with regard to the Public Authority's obligation to maintain confidentiality of trade secrets.

6.5 Indemnity. To the fullest extent permitted by law, the Subcontractor shall indemnify, defend, and hold harmless the Public Authority, the Contractor, their consultants and employees from all claims and expenses for bodily injury and property damage other than to the Work itself that may arise from the performance of the Subcontract Work, including

reasonable attorneys' fees, costs and expenses, but only to the extent caused by the negligent acts or omissions of the Subcontractor or a person or entity for whom the Subcontractor may be liable. This Subcontract does not require a Subcontractor to waive its immunity under the Workers Compensation laws of Ohio from claims brought against the Subcontractor by the Subcontractor's employees.

6.6 Prompt Pay. The Contractor shall at a minimum make payments to the Subcontractor in accordance with Applicable Law, including ORC Section 4113.61. Progress payments to the Subcontractor for satisfactory performance of Subcontract Work shall be made no later than 10 days after receipt by the Contractor of payment from the Public Authority for Subcontract Work.

6.7 Retainage. Subcontractor retainage shall be at a rate equal to the percentage retained from the Contractor's payment by the Public Authority for the Subcontract Work, unless a lesser percentage is otherwise specified.

6.7.1 Labor Payments.

6.7.1.1 Partial payments to the Subcontractor for labor performed shall be made at the rate of 92 percent of the amount invoiced through the Subcontractor's request for payment that shows the Work of the Subcontractor is 50 percent complete.

6.7.1.2 After the Work of the Subcontractor is 50 percent complete, as evidenced by payments of at least 50 percent of the total amount due under the Subcontract, no additional funds shall be retained from payments for labor.

6.7.2 Material Payments.

6.7.2.1 The Contractor shall pay the Subcontractor at the rate of 100 percent of the scheduled value for materials incorporated into the Project.

6.7.2.2 The Contractor shall pay the Subcontractor at the rate of 92 percent of the invoice cost, not to exceed the scheduled value, for materials delivered to the Site, or other off-site storage location approved by the A/E, provided the Subcontractor provides the following information with its request for payment:

- **.1** a list of the fabricated materials consigned to the Project, giving the place of storage, together with copies of invoices, in order to verify quantity and cost; and
- **.2** a certification of materials stored off-site, prepared by the Subcontractor and signed by the A/E to evidence that the materials are in conformity with the Specifications and have been tagged with the Project name and number for delivery to the Project. The Subcontractor shall reimburse the A/E, through the Contractor, for all costs incurred to visit a storage site, other than the areas adjacent to the Project.
- **.3** The Contractor shall pay the balance of the scheduled value when the materials are incorporated into and become a part of the Project.

6.8 Warranty. The Subcontractor fully warrants, for the benefit of the Public Authority, that all materials and equipment shall be new unless otherwise specified, of good quality, in conformance with the Contract Documents and free from defective workmanship or materials.

6.9 Non-Waiver of Lien Rights or Payment Bond Rights. This Subcontract shall not prohibit a Subcontractor from exercising its rights under ORC Chapter 1311 or under any Contractor-provided payment bond.

6.10 Non-Discrimination. The Subcontractor agrees to fully comply with Applicable Law regarding equal opportunity, including ORC Section 153.59 and, to the extent applicable, all Executive Orders issued by the Governor of the state of Ohio.

6.11 Dispute Resolution. The supplemental conditions to this Subcontract shall provide for a dispute resolution process comparable to the Contract's dispute resolution process in terms of timing, notice, substantiation, and informal dispute resolution efforts. The dispute resolution process provided in the supplemental conditions shall result in prompt access to the ultimate dispute resolution mechanism selected by the parties.

6.12 In the event that any supplemental conditions or other Subcontract terms conflict with the **State of Ohio Subcontract Form**, the **State of Ohio Subcontract Form** takes precedence and this Subcontract shall be read and enforced to include the provisions of the **State of Ohio Subcontract Form**.

6.13 The following exhibits are attached to and are a part of this Subcontract:

6.13.1 Exhibit A:

6.13.2 Exhibit B:

6.13.3 Exhibit C:

6.13.4 Exhibit D:

SIGNATURES

IN WITNESS WHEREOF, the parties have executed this Subcontract Form.

«INSERT SUBCONTRACTOR'S NAME»	**«INSERT CONTRACTOR'S NAME»**
Signature	*Signature*
Printed Name	*Printed Name*
Title	*Title*
	Date

END OF DOCUMENT

CONTRACT

THIS AGREEMENT, made this the _____ day of _____ , 20___ , by and between the Board of Park Commissioners of the Clermont County Park District, hereinafter called the "Owner"

and _____ _____,_____
(name of contractor) (type of business organization)

organized under the laws of the State of _____ , hereinafter called "Contractor."

Witnessed: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the Owner, the Contractor hereby agrees with the Owner to commence and complete the construction described as follow:

Kathryn Stagge-Marr Park Shelter hereinafter called the PROJECT,

for the sum of

_____ Dollars
($ _____) and all extra work in connection therewith, under the terms as stated in the General Conditions, Supplemental General Conditions, and Work and Material Specifications of the Contract, and at his (its or their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions, Supplemental General Conditions and Special Conditions of the Contract, the Information and Instructions to Bidders, the plans which include all maps, plats, blueprints, and other drawings and printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by the Clermont County Park District all of which are made a part of this Contract.

The Contractor hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete Project within 240 consecutive calendar days thereafter.

The Owner agrees to pay the Contractor in current funds for the performance of the Project, subject to additions and deductions, as provided in the General Conditions of the Project, and to make payments on account thereof as provided in Paragraph 27, "Payments to Contractor," in Section B of the Standard General Conditions.

IN WITNESS WHEREOF, the parties execute this contract in three (3) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

BOARD OF PARK COMMISSIONERS
OF THE CLERMONT COUNTY PARK DISTRICT

By _____
Josh Torbeck, Executive Director

CONTRACTOR

By _____
Name:_____
Title:_____

PERFORMANCE-PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we_____
(correct name of contractor)

a_____
(a corporation, a partnership, or an individual d.b.a.)

hereinafter called "Principal" and
(correct name of surety)

hereinafter called "Surety," are held and firmly bound _____
(correct name of Owner)

hereinafter called "Owner" in the penal sum of_____

Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner,

dated the_____day of _____, 20_____,
(leave blank, to be filled in when executed)

a copy of which is hereto attached and made a part hereof for the construction of:

Kathryn Stagge-Marr Park Shelter

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original terms thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, and shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or the work or these specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed, each counterpart of which shall be deemed an original, this the_____ day of_____ , 20_____.

ATTEST

Principal

By _____(1)
Name:_____
Title:_____
Address:_____
_____

NOTE: (1) If Contractor is Partnership, all partners should execute bond

Surety

By _____(1)
Name:_____
Title:_____
Address:_____
_____

IMPORTANT: Surety companies executing bonds must appear on the Treasury Department's most current list and be authorized to transact business in Ohio.

PROSECUTING ATTORNEY'S CERTIFICATE

I hereby certify that I have examined the contract and bond attached between the Board of Park Commissioners of Clermont County Park District, and _____ _____ , Contractor, and find same to be in accordance with the provisions of law and hereby approve said contract and bond as to form.

_____
Assistant Prosecuting Attorney
Clermont County, Ohio

_____, 20___.

CERTIFICATE OF SUBSTANTIAL COMPLETION AND GUARANTY

The _____
(Name of Company)
hereinafter referred to as "Contractor" having heretofore entered into a contract with **the Board of Park Commissioners of the Clermont County Park District** dated _____for the Improvement, Repair, and/or Construction of:

Kathryn Stagge-Marr Park Shelter

and in accordance with the terms of said contract do hereby guaranty that all labor, materials, and equipment furnished and work performed by the Contractor and/or his subcontractors under said contract, EXCLUDING restoration and site improvements, is in conformity with such plans and specifications and authorized alterations thereto and that such Improvement, Repair, and/or Construction installed pursuant to said contract is free from imperfect workmanship and materials, and the Contractor agrees to repair at the Contract's sole cost and expense all of the work covered under said contract and change orders which may prove to be defective for a period of one (1) year from the date hereof. Furthermore, the Contractor agrees to repair at the Contractor's cost, any work which may be affected or disturbed in making the repairs herein contemplated.

The Contractor does further warrant that he knows of no claim for or possible claim for damages or injuries relative to the above work, labor, and material as against himself, his laborers, and employees or his subcontractors, their laborers, and employees except: _____

_____
(if none, write none)

It is understood and agreed that the **Board of Park Commissioners of the Clermont County Park District,** shall be the sole judge of any imperfections, and the within repairs done under their supervision.

We concur that the one (1) year warranty or performance period for all labor, material, and equipment (EXCLUDING restoration and site improvements) should begin as of:

Guaranty Period Begins:

_____

IN WITNESS WHEREOF, the parties execute this Certificate of Substantial Completion in one (1) counterpart, of which shall be deemed an original, in the year and day first above mentioned.

_____
(Contractor)
By _____
Title _____
Date

Clermont County Park District
By_____
Title _____
Date

CERTIFICATE OF FINAL COMPLETION AND GUARANTY

The _____
(Name of Company)
hereinafter referred to as "Contractor" having heretofore entered into a contract with the **Board of Park Commissioners of the Clermont County Park District,** dated _____ for the Improvement, Repair, and/or Construction of:

Kathryn Stagge-Marr Park Shelter

and in accordance with the terms of said contract do hereby guaranty that all labor, materials, and equipment furnished and work performed by the Contractor and/or his subcontractors under said contract, INCLUDING restoration and all site improvements, is in conformity with such plans and specifications and authorized alterations thereto and that such Improvement, Repair, and/or Construction installed pursuant to said contract is free from imperfect workmanship and materials, and the Contractor agrees to repair at the Contract's sole cost and expense all of the work covered under said contract and change orders which may prove to be defective for a period of one (1) year from the date hereof. Furthermore, the Contractor agrees to repair at the Contractor's cost, any work which may be affected or disturbed in making the repairs herein contemplated.

The Contractor does further warrant that he knows of no claim for or possible claim for damages or injuries relative to the above work, labor, and material as against himself, his laborers, and employees or his subcontractors, their laborers, and employees except: _____

_____
(if none, write none)

It is understood and agreed that the **Board of Park Commissioners of the Clermont County Park District,** shall be the sole judge of any imperfections, and the within repairs done under their supervision.

We concur that the one (1) year warranty or performance period for all material and equipment (INCLUDING restoration and site improvements) should begin as of:

Guaranty Period Begins:

_____

WITNESS WHEREOF, the parties execute this Certificate of Final Completion in one (1) counterpart, of which shall be deemed an original, in the year and day first above mentioned.

_____
(Contractor)

By _____
(Secretary/Witness) Title _____
Date

Clermont County Park District

(Witness) By_____
Title _____
Date

Activity	Date
1st Advertisement	8/10/2023
2nd Advertisement	8/17/2023
Pre-Bid Meeting	8/24/2023 at 3:00 PM
3rd Advertisement	8/24/2023
Last Day for Questions	9/3/2023 at 5:00 PM
Bid Opening	9/8/2023 at 3:00 PM
Bid Award	9/14/2023
Mobilization	9/15/2023
Substantial Completion	4/15/2024
Final Completion	5/13/2024

SECTION B

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

INDEX

STANDARD GENERAL CONDITIONS

INDEX
(Continued)

GENERAL CONDITIONS

1. CONTRACT AND CONTRACT DOCUMENTS

The Plans, Specifications, and Addenda, enumerated in these Standard General Conditions, Supplemental General Conditions, and Work and Material Specifications shall form part of this Contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth.

2. DEFINITIONS

The following terms as used in this contract are respectively defined as follows:

(a) "Owner": Clermont County Park District Board of Park Commissioners: A person, firm, agency, commission, or political subdivision empowered by law to contract for the planning and construction of the project.

(b) "Owner's Representative" - Consulting Engineering Firm under contract with the Owner to provide construction administration services: The project representative designated by the Owner to plan and direct the work set forth by the Contract between the Owner and Contractor.

(c) "Contractor": A person, firm, or corporation with whom the Contract is made by the Owner.

(d) "Subcontractor": A person, firm, or corporation supplying labor and materials or only labor for work at the site of the project for, and under separate contract or agreement with, the Contractor.

3. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS:

The Contractor will be furnished additional instructions and detail drawings as necessary to carry out the work included in the contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents and will be so prepared that they can be reasonably interpreted as part thereof. The Contractor shall carry out the work in accordance with the additional detail drawings and instructions.

4. SHOP OR SETTING DRAWINGS:

The Contractor shall submit promptly to the Owner's Representative a minimum of four (4) copies of each shop or setting drawings. After review and examination of such drawings by the Owner's Representative and the return thereof, the Contractor shall make such corrections to the drawings and shall resubmit to the Owner's Representative four (4) corrected copies. The Owner's Representative will return to the Contractor one (1) approved copy of the shop or

setting drawings. If requested by the Owner's Representative, the Contractor must furnish additional copies. Regardless of corrections made in or approval given to such drawings by the Owner's Representative, the Contractor will nevertheless be responsible for the accuracy of such drawings and for their conformity to the Plans and Specifications. As-Built shop or setting drawings shall be forwarded by the Contractor to the Owner's Representative within thirty (30) days of completion of the project. The As-Built drawings (2 sets will be required) shall be submitted such that one set is on mylar paper and one set is on paper.

5. MATERIALS, SERVICES, AND FACILITIES:

(a) It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities of every nature, whatsoever necessary to execute, complete, and deliver the work within the specified time.

(b) Any work necessary to be performed after regular working hours, on Saturdays, Sundays or Legal Holidays, shall be performed without additional expense to the Owner.

(c) Clermont County Park District recognizes the following as Legal Holidays: New Year’s Day, Martin Luther King Day, President’s Day, Memorial Day, Juneteenth Day, Independence Day, Labor Day, Columbus Day, Veteran’s Day, Thanksgiving Day, and Christmas Day.

6. TEMPORARY FACILITIES:

(a) Sanitary Provisions:
The Contractor shall furnish sanitary facilities for all employees engaged in work at the site. Said sanitary facilities shall meet the requirements and approval of the Owner's Representative and the Clermont County General Health District having jurisdiction. The said facilities shall be located so as to be easily accessible to all employees at the site and said facilities are to be installed when the first work is begun on the project.

(b) Temporary Electric Service:
Temporary electric power required for the execution of all work shall be furnished by the Owner from existing outlets where available. Power requirements exceeding those which can be conveniently furnished from the existing service or power requirements at locations where outlets are not available shall be the responsibility of the Contractor. Cost of power from the Owner's service will be paid by the Owner.

7. PROJECT SIGN:

The Contractor shall supply, construct, erect, and maintain throughout the entire life of the contract at his cost one (1) single-sided 4' x 8' project sign. All signs shall be made of 3/4" exterior grade plywood, supported by two (2) 4"x 4" x 12' pressure-treated posts, with suitable exterior paint.

Each sign shall consist of a white background. Lettering shall be black.

Sizes of lettering, the approximate amount of lettering, and all layouts of the signs shall be as shown on Page B-4.

The location the Contractor proposes to erect the project sign shall be approved by the Owner's Representative.

Tentative lettering is as follows:

CLERMONT COUNTY PARK DISTRICT

Kathryn Stagge-Marr Park Shelter

COST $ XXX,XXX.00

BOARD OF PARK COMMISSIONERS

John Stowell, Andrew McAfee, David Anspach

8. CONTRACTOR'S TITLE TO MATERIALS:

No materials or supplies for the work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the work, free from all liens, claims or encumbrances.

9. INSPECTION AND TESTING OF MATERIALS:

(a) All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The Laboratory or inspection agency shall be selected by the Owner. The Contractor will pay for all laboratory inspection service direct, and not as part of the Contract.

(b) Materials of construction, particularly those upon which the strength and durability of the structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for uses intended. The Contractor will pay for all inspection and testing as directed by the Owner in conformance with said Specifications.

10. "OR EQUAL" CLAUSE:

Whenever a material or article required is specified or as shown on the plans by using the name of the proprietary product or of a particular manufacturer or vendor, any material or article which will perform adequately the duties imposed by the general design will be considered equal and satisfactory provided the material or article so proposed is of equal substance and function in the Owner's Representative's opinion. It shall not be purchased or installed without Owner's Representative's written approval.

11. PATENTS:

(a) The Contractor shall hold and save the Owner and its officers, agents, and employees harmless from 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 performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.

(b) License or Royalty Fees: License and/or Royalty Fees for the use of a process which is authorized by the Owner of the project must be reasonable, and paid to the holder of the patent, or his authorized licensee, direct by the Owner and not by or through the Contractor.

(c) If the Contractor uses any design, device, or materials covered by letters, patent, or copyright: he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device, or material. It is mutually agreed and understood, that, without exception, the contract prices shall include all royalties or costs arising from the use of such design, device, or materials, in any way involved in the work. The Contractor and/or his Sureties shall indemnify and save harmless the Owner of the project from any and all claims from infringement by

reason of the use of such patented or copyrighted design, device, or materials or any trademark or copyright in connection with work agreed to be performed under this contract, and shall indemnify the Owner for any cost, expense, or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

12. CONSTRUCTION STAKING AND SURVEYING:

The Contractor shall provide all construction staking required for the layout of project as specified in the Work and Material Section of these Specifications.

13. CONTRACTOR'S OBLIGATIONS AND RESPONSIBILITIES:

The Contractor shall and will, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery, equipment, facilities, and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this contract, within the time herein specified, in accordance with the provisions of this contract and said specifications and in accordance with the plans and drawings covered by this contract and any and all supplemental plans and drawings, and in accordance with the directions of the Owner's Representative as given from time to time during the progress of the work. He shall furnish, erect, maintain, and remove such construction plant and such temporary works as may be required. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements, and limitations of the contract and specifications, and shall do, carry on, and complete the entire work to the satisfaction of the Owner's Representative. The Contractor shall provide and maintain for the duration of the work as required all sheeting, bracing, temporary ladders, and similar temporary construction, in compliance with State and local laws, as may be necessary for the performance of his work.

The Contractor shall be responsible to maintain and record all changes of all work on the drawings, specifications, change orders, field orders, and shop drawings that are to be kept as the record set. This record set shall be turned over to the Owner's Representative upon completion and acceptance of the project.

14. WEATHER CONDITIONS:

In the event of temporary suspension of work, or during inclement weather, or whenever the Owner's Representative shall direct, the Contractor will, and will cause his subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the Owner's Representative, any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors so to protect their work, such materials shall be removed and replaced at the expense of the Contractor.

15. PROTECTION OF WORK AND PROPERTY - EMERGENCY:

The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this contract. He shall at all times safely guard and protect his own work, and that of adjacent property, from damage. The Contractor shall replace or make good any such damage, loss or injury unless such be caused directly by errors contained in the contract or by the Owner, or his duly authorized representatives.

In case of any emergency which threatens loss or injury of property, and/or safety of life, the Contractor will be allowed to act, without previous instructions from the Owner's Representative in a diligent manner. He shall notify the Owner's Representative immediately thereafter.

Where the Contractor has not taken action but has notified the Owner's Representative of an emergency threatening injury to persons or damage to the work or any adjoining property, he shall act as instructed or authorized by the Owner's Representative.

The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided in Paragraph 19 of this section.

16. INSPECTION AND TESTING:

The Owner's Representative and any other participating or approving agency of government shall be permitted to inspect all work, materials, and equipment.

The Contractor shall furnish at his expense and as required by the Owner's Representative, additional expertise (as needed) to perform all testing procedures.

17. REPORTS, RECORDS, AND DATA:

The Contractor shall submit to the Owner's Representative such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records, and other data as the Owner's Representative may request concerning work performed or to be performed under this contract.

18. SUPERINTENDENCE BY CONTRACTOR:

At the site of the work the Contractor shall employ a construction superintendent or foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Owner's Representative and shall be one who can be continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll.

19. CHANGES IN WORK:

No changes in the work covered by the approved contract documents shall be made without having prior written approval of the Owner. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of the following methods.

(a) Unit bid prices previously approved.

(b) An agreed lump sum.

(c) The actual cost of :

1. Labor, including foreman;
2. Materials entering permanently into the work;
3. The ownership or rental cost of construction plant and equipment during the time of use on the extra work;
4. Power and consumable supplies for the operation of power equipment;
5. Insurance;
6. Social Security and old age and unemployment contributions.

To the cost under (c) there shall be added a fixed fee to be agreed upon but not to exceed fifteen percent (15%) of the estimated cost of the work. The fee shall be compensation to cover the cost of supervision, overhead, bond, profit, and any other general expenses.

The Contractor is entitled to a fixed fee not to exceed five percent (5%) to be added to the change order work under (c) performed by a subcontractor. The fee shall be compensation to cover the cost of supervision, overhead, bond, profit, and any other general expenses.

20. EXTRAS:

Without invalidating the contract, the Owner may order extra work or make changes by altering, adding, or deducting from the work, the contract sum being adjusted accordingly, and the consent of the Surety being first obtained where necessary or desirable. All the work of the kind bid upon shall be paid for at the price stipulated in the proposal, and no claims for any extra work or materials shall be allowed unless the work is ordered in writing by the Owner or Owner's Representative, acting officially for the Owner, and the price is stated in such order.

21. TIME FOR COMPLETION AND LIQUIDATED DAMAGES:

If the Contractor shall neglect, fail, or refuse to complete the work within the time herein specified, or if any proper extension thereof granted by the Owner, then the Contractor does hereby agree as a part consideration for the awarding of this contract, to pay the Owner the amount specified in the Contract, not as penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

Since time is an ESSENTIAL ELEMENT of this Contract, there shall be assessed against the Contractor, and the Contractor agrees to pay **$300** per day. This amount is considered liquidated damages and not as penalty. This amount shall be assessed for each and every calendar day, after the expiration of the Contract life required to complete the Contract.

The Contractor agrees that said work shall be performed regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

(a) To any preference, priority, or allocation order issued by the Government;

(b) To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; and

(c) To any delays of subcontractors or suppliers occasioned by any of the causes specified in subsection (a) and (b) of this article;

Provided, Further, that the Contractor shall, within ten (10) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the Contract, notify the Owner, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

22. CORRECTION OF WORK:

All work, all materials, whether incorporated in the work or not, all processes of manufacture, and all methods of constructions shall be at times and places subject to the inspection of the Owner's Representative who shall be the final judge of the quality and suitability of the work, materials, processes of manufacture, and methods of construction for the purposes for which they are used. Should they fail to meet their approval they shall be forthwith reconstructed, made good, replaced, and/or corrected, as the case may be, by the Contractor at his own expense. Rejected material shall immediately be removed from the site. If, in the opinion of the Owner's Representative, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not performed in accordance with the Contract Documents, the compensation to be paid to the Contractor hereunder shall be reduced by such amount as in the judgment of the Owner's Representative shall be equitable.

23. SUBSURFACE CONDITIONS FOUND DIFFERENT:

Should the Contractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the plans or indicated in the specifications, he shall immediately give notice to the Owner's Representative of such conditions before they are disturbed. The Owner's Representative will thereupon promptly investigate the conditions, and if the Owner's Representative finds that they are materially differing from those shown on the Plans or indicated in the Specifications, the Owner's Representative will at once make such changes in the Plans and/or Specifications as are found necessary, any increase or decrease of cost resulting from such changes to be adjusted in the manner provided in Paragraph 19 of this section.

24. RIGHT OF THE OWNER TO TERMINATE CONTRACT:

In the event that any of the provisions of this contract are violated by the Contractor, or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate the contract, such notices to contain the reasons for such intention to terminate the contract, and unless within ten (10) days after the serving of such notice upon the Contractor such violation or delay shall cease and satisfactory arrangement of correction be made, the contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the Surety and the Contractor, and the Surety shall have the right to take over and perform the contract; provided, however, that if the Surety does not commence performance thereof within ten (10) days from the date of the mailing to such Surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract or by force account for the account and at the expense of the Contractor; and the Contractor and his Surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the site of the work and necessary therefore.

The Owner may terminate the Contract for the Owner's convenience at any time. The Contractor will be compensated for added expense not including anticipated profits for termination of the Contract for the convenience of the Owner. This section is subject to the provisions of 5525.14, ORC.

25. CONSTRUCTION SCHEDULE:

Immediately after execution and delivery of the contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule.

26. PERIODIC ESTIMATES FOR PARTIAL PAYMENT:

The Contractor shall also furnish on forms to be provided by the Owner's Representative, or form approved by the Owner's Representative, a complete breakdown of the contract price and periodic itemized estimates of work done for the purpose of making partial payments. The original completed form must be submitted for approval by the Owner's Representative before first partial payment is requested.

27. PAYMENTS TO CONTRACTOR:

(a) The Owner shall make a Progress payment to the Contractor, on the basis of a duly certified and approved estimate of the work performed during the preceding calendar month under this Contract, no later than 30 days from receipt of a mathematically correct estimate. The contractor shall submit to the owner the percentage of completed work based upon the work breakdown in the Schedule of Values. To insure the proper performance of this contract, the OWNER shall retain eight percent (8%) of the amount of each estimate until final completion and acceptance of all work covered by the Contract; Provided that the Owner at any time after 50% of the work has been completed, if it finds that satisfactory progress is being made, may make any of the remaining Progress Payments in full: Provided Further, that on completion and acceptance of each separate building, public work, or other divisions of the Contract, on which the price is stated separately in the Contract, payment may be made in full, including retained percentages thereon, less authorized deductions. Monies held for retainage on labor and material will remain in the Clermont County Park District's Capital Improvement Account until the time of completion of fifty percent (50%) of the Contract. At this time, the retainage will be deposited, in accordance with Section 153.63 of the Ohio Revised Code, in a joint escrow account with the Owner and Contractor required to co-sign any withdrawals. The joint escrow account will be established in a bank or building and loan association in the state that will be selected by mutual agreement between the Contractor and the Owner.

(b) In preparing estimates, the material delivered on the site and preparatory work done may be taken into consideration. All documentation such as material invoices, payroll records, signed affidavits, etc. must be submitted with estimates.

(c) All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as waiver of the right of the Owner to require the fulfillment of all of the terms of the contract.

(d) Prior to first payment, owner requires project schedule for construction and expected draw-down schedule.

(e) Owner's Right to Withhold Certain Amounts and Make Application Thereof: The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the lawful demands of

subcontractors, laborers, workmen, mechanics, materialmen, and furnisher of machinery and parts, thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the said Contractor, either pay unpaid bills, of which the Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of this contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his Surety. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor and any payment so made by the Owner shall be considered as a payment made under the contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payment made in good faith.

28. PRE-FINAL PAYMENT:

Upon receipt of written notice that the work is completed and acceptable under the contract documents and the contract is fully performed and ready for final inspection by Owner, the Contractor shall submit a pre-final periodic estimate along with the following:
(NOTE: The final periodic estimate includes only retainage withheld in accordance with Paragraph 27 of this section.)

(1) Final Affidavit of Prime or Subcontractor:
This original affidavit shall list all subcontractors and material suppliers and demonstrate that all bills for services, materials, equipment, and other indebtedness, including all payroll of the Prime Contractor, connected with the work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied or set out the amounts owed. In order to establish full payment to Subcontractors and material suppliers, Final Waivers of Lien and/or Material-Mens Certificates must be attached for each Subcontractor and/or material supplier utilized under this contract. If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify him against any such lien.

(2) Certificate of Substantial Completion and Guaranty:
Previously signed and executed by the Contractor and Owner's Representative(s).

(3) Certificate of Final Completion and Guaranty:
To be signed and executed by the Contractor and Owner's Representative(s).

(4) Prevailing Wage Affidavit:
Also required of all subcontractors.

29. FINAL PAYMENT:

Upon receipt of written notice that the work is completed and acceptable under the contract documents and the contract is fully performed and final inspection completed and approved by Owner's Representative, the Contractor shall submit a final periodic estimate, which shall include the retainage withheld in accordance with Paragraph 27 of this section, along with the following:

(1) Consent of Surety to Final Payment: To be provided by Surety.

30. ACCEPTANCE OF FINAL PAYMENT AS RELEASE:

The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor for all things done or furnished in connection with this work and for every act and neglect of the Owner and others relating to or arising out of this work. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations under this contract or the Performance and Payment Bond.

31. PAYMENTS BY CONTRACTOR:

The Contractor shall pay (a) for all transportation and utility services not later than 15 days after receiving payment from Owner, following that in which services are rendered, (b) all Subcontractors, materials, tools, and other expendable equipment shall be paid to the extent of 90% of the cost thereof, not later than 15 days after receiving payments from Owner, and the balance following 30 days after the completion of that part of the work in or on which such materials, tools, and equipment are incorporated or used, and (c) to each of his subcontractors, final payment shall be paid before required for final release of final payment.

32. CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE:

The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until the insurance required of the subcontractor has been so obtained and approved.

(a) Workers' Compensation Insurance: The Contractor shall procure and shall maintain during the life of this contract Workers' Compensation Insurance as required by applicable State or territorial law for all of his employees to be engaged in work at the site of the project under this contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Workers' Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workers' Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this contract is not protected under the Workers' Compensation Statute, the Contractor shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of his employees as are not otherwise protected.

(b) Contractor's Public Liability and Property Damage Insurance: Contractor shall carry commercial general liability insurance for bodily injury, personal injury, and property damage in an amount not less than $1,000,000 per occurrence and $2,000,000 in the aggregate while performing any services for the Owner in accordance with the terms of this Agreement. Contractor shall provide to the Owner a certificate of insurance listing the Board of Park Commissioners of the Clermont County Park District and all of their respective officials, employees, representatives, servants, volunteers, successors, assigns, and agents as additional insured as proof of compliance with this condition. Contractor shall also maintain liability insurance to cover all of its employees and agents for any liability arising out of their conduct while in the employ of the Contractor in connection with the services rendered pursuant to this Agreement. Contractor's insurance coverage shall be the primary insurance with respect to the Owner and its officials, employees, representatives, servants, volunteers, successors, assigns, and agents. Any insurance maintained by the Owner shall be excess of Contractor's insurance and shall not contribute to it. Contractor's insurance shall be provided by insurers with an AM Best rating of no less than A: VII.

(c) Subcontractor's Public Liability and Property Damage Insurance: The Contractor shall either:

1. Require each of his subcontractors to procure and maintain during the life of his subcontract Subcontractor's commercial general liability insurance for bodily injury, personal injury, and property damage in an amount not less than $1,000,000 per occurrence and $2,000,000 in the aggregate while performing any services. Subcontractor's insurance shall be provided by insurers with an AM Best rating of no less than A: VII.
2. Insure the activities of the subcontractors in his policy, specified in subparagraph (b) hereof.

(d) Contractor's Risk Insurance: Each contractor shall maintain insurance to protect himself and/or the Board from loss incurred by fire, lightning, extended coverage hazards, vandalism, theft, explosion, and malicious

mischief in the full amount of the contract and such insurance shall cover all labor and materials connected with the work, including materials

delivered to the site but not yet installed.

(e) Scope of Insurance and Special Hazards: The insurance required under subparagraphs (b) hereof shall provide adequate protection for the Contractor and his subcontractors, respectively, against damage claims which may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him and, also against any of the special hazards which may be encountered in the performance of his contract.

Explosives are not permitted on the job site without first obtaining written permission from the Owner. If such permission is granted, Contractor shall obtain all insurance and permits required to protect Contractor for damage which may be caused by blasting. Notification shall be made to all area property owners by the Contractor not later than 48 hours prior to the detonation of explosives as permitted by the Owner.

(f) Proof of Insurance: The Contractor shall furnish the Owner with Certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be canceled or materially altered, except after thirty (30) days written notice has been received by the Owner, or ten (10) days written notice in the event of non-payment of premiums." Such certificates shall be supplied with the submittal of the Contract Documents following Bid Award.

33. CONTRACT SECURITY:

The Contractor shall furnish a performance and payment bond in an amount equal to one hundred percent (100%) of the contract price as security for the faithful performance of this contract, as security for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract.

34. ADDITIONAL OR SUBSTITUTE BOND:

If at any time the Owner for justifiable cause, shall be or become dissatisfied with any surety or sureties then upon the Performance and Payment Bond, the Contractor shall within five (5) days after notice from the Owner so to do, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished such an acceptable bond to the Owner.

35. ASSIGNMENTS:

The Contractor shall not assign the whole or any part of this contract or any monies due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any monies due or to become due under this contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the systematic Contractor shall be subject to prior claims of all persons, firms, and corporations for services rendered or materials supplied for the performance of the work called for in this contract.

36. MUTUAL RESPONSIBILITY OF CONTRACTORS:

If, through acts of neglect on the part of the Contractor, any other contractor or any subcontractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration if such other contractor or subcontractor will so settle. If such other contractor or subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

37. SEPARATE CONTRACTS:

The Contractor shall coordinate his operations with those of other contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including his subcontractors, shall keep informed of the progress and the detail work of other contractors and shall notify the Owner's Representative immediately of lack of progress or defective workmanship on the part of other Contractors. Failure of a contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

38. SUBCONTRACTING:

(a) The Contractor may utilize the service of specialty subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty subcontractors.

(b) The Contractor shall not award any work to any subcontractor without prior written approval of the Owner, which approval will not be given until the Contractor submits to the Owner a written statement concerning the proposed award to the subcontractor, which statement shall contain such information as the Owner may require and shall execute the Subcontract Form with each Subcontractor in accordance with Section 153:1-3-02 of the Ohio Administrative Code.

(c) The Contractor shall be as fully responsible to the Owner for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

(d) The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by terms of the General Conditions and other contract documents in total as applicable to the work of subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the contract documents.

(e) All changes in work performed by a subcontractor are subject to Paragraph 19 of the General Conditions.

(f) Nothing contained in this contract shall create any contractual relation between any subcontractor and the Owner.

39. CLERMONT COUNTY PARK DISTRICT AUTHORITY:

The Clermont County Park District shall give all orders and directions contemplated under this contract and specifications relative to the execution of the work. The Clermont County Park District shall determine the amount, quality, acceptability, and fitness of the several kinds of work and materials which are to be paid for under this contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Clermont County Park District's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any questions shall arise between the parties hereto relative to said contract or specifications, the determination or decision of the Clermont County Park District shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question.

The Clermont County Park District shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found obscure or be in dispute. Any differences or conflicts in regard to their work which may arise between the Contractor under this contract and other contractors performing work for the Owner shall be adjusted and determined by the Clermont County Park District.

40. USE OF PREMISES AND REMOVAL OF DEBRIS:

The Contractor expressly undertakes at his own expense:

(a) to take every precaution against injuries to persons or damage to property;

(b) to store his apparatus, materials, supplies, and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or the work of any other contractors;

(c) to place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work;

(d) to clean up daily all refuse, rubbish, scrap materials, and debris caused by his operations, to the end that at all times the site of the work shall present a neat, orderly and workmanlike appearance;

(e) before final payment to remove all surplus material, false-work, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operations, and to put the site in a neat, orderly condition;

(f) to affect all cutting, fittings, or patching of his work required to make the same to conform to the plans and specifications and, except with the consent of the Owner's Representative, not to cut or otherwise alter the work of any other contractor.

41. MATERIALS:

All materials that are to be incorporated into the finished project shall be new materials unless otherwise noted on the plans or stated in the material specifications, or pursuant to a written change order from the Owner.

Any items required including labor, equipment, and/or materials but not shown as a separate pay item in the proposal shall be furnished and installed as incidental to the Contract, except as noted in the Specifications.

42. QUANTITIES OF ESTIMATE:

Wherever the estimated quantities of work to be done and materials to be furnished under this contract are shown in any of the documents including the proposal, they are given for use in comparing bids. Periodic pay quantities will be calculated based on the measured field dimensions and shall not exceed the quantities as specified on the plans unless otherwise specified herein or approved in the field by the Owner's Representative due to specific field conditions. Any additional materials required to construct the proposed improvements as specified and shown on the Plans will be paid at the unit price bid for this contract. All claims for extra cost shall conform to Paragraph 19 of this section and will be the result of a change in the scope of the contract as directed and approved by the Owner and/or Owner's Representative. The Owner especially

reserves, except as herein otherwise specifically limited, to increase or diminish quantities through a change in the scope of the work as may be deemed reasonably necessary or desirable to complete the work contemplated by this contract, and such increase or diminution shall in no way violate this contract, nor shall any such increase or diminution give cause for claims or liability for damages.

43. CONSTRUCTION RIGHTS-OF-WAY:

The Owner shall furnish all land and rights-of-way necessary for the carrying out of this contract and the completion of the work herein contemplated and will use due diligence in acquiring said land and rights-of-way as speedily as possible. But it is possible that all lands and rights-of-way may not be obtained as herein contemplated before construction begins, in which event the Contractor shall begin his work upon such land and rights-of-way as the Owner may have previously acquired and no claim for damages whatsoever will be allowed by reason of the delay in obtaining the remaining lands and rights-of-way. Should the Owner be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the commencement, by reason of any litigation, or by reason of its inability to procure any lands or right-of-way for the said work, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay, or to withdraw from the contract except by consent of the Owner; but time for completion of the work will be extended to such time as the Owner determines will compensate for the time lost by such delay, such determination to be set forth in writing.

It is the Owner's intent that sufficient working room be available for the Contractor's use in construction of the project. This construction Right-of-Way appears on the plans and the Owner shall procure and pay all costs. However, should the Contractor require additional work area due to his methods and means, it shall be his responsibility to acquire temporary construction area as he deems necessary at no additional cost to the Owner. Temporary construction easement copies shall be required by the Owner before allowing Contractor to exceed the construction Right-of-Way.

44. AGREEMENTS WITH PROPERTY OWNERS:

The Owner strongly discourages the Contractor from entering into any agreements either oral or written with any property owners in or around the project area concerning storage of materials and/or equipment, release of excess backfill, or other issues. However, should the Contractor choose to enter into such an agreement, it must be in written form and a written copy of this agreement signed by all parties involved and addressing all provisions and terms of the agreement, must be submitted in writing to the Owner's Representative prior to any action taken as per the terms of the agreement.

In no way is the Owner to be held responsible or liable for any agreements either oral or written between the Contractor and any other parties.

45. PERMITS FOR WORK ON OR ALONG STATE, COUNTY, TOWNSHIP, AND VILLAGE ROADS:

All permits from the Ohio Department of Transportation and the Clermont County Engineer required for work on, across, or along State or County Highways shall be obtained by the Owner. The Contractor shall be solely responsible to obtain all permits for all work along Township and Village roads required to complete all work or extra work under this contract or instructed by the Owner. The Contractor has the duty of complete and full compliance with all said permits.

46. RESTORATION OF PAVEMENT:

All pavement and/or roadway surface disturbed by the Contractor, other than restoration over trenches as provided by these specifications, shall be restored by the Contractor at his expense and in conformance with the regulations of the governing authority of said roadways. In the absence of such regulations, the restoration shall be in accordance with instructions by the Owner's Representative with the objective of restoring the paving or roadway surface to the original condition of same.

47. STORM CULVERTS:

All driveway or roadway storm culvert pipe shown on the plans or not shown on the plans that runs parallel to the proposed facilities and need to be removed due to excavation shall be replaced at the original line and grade unless otherwise provided by these specifications as a separate bid item. If the pipe is damaged or broken by the Contractor, it shall be replaced with a new storm culvert pipe as directed by the Owner's Representative at the Contractor's expense.

48. MAINTENANCE OF TRAFFIC:

The Contractor shall, unless permission is received from the Owner to do otherwise, maintain at all times vehicular and pedestrian traffic during the progress of the work. At no time, except as hereinabove mentioned, during the work shall the Contractor block any road, street, or throughway more than one-half (1/2) mile. If at any time one-way traffic is maintained, the Contractor shall furnish two (2) flagmen. When open cutting any road or areas requiring public access like parks, cemeteries, and businesses; the Contractor shall use steel plates to accommodate vehicles over open trenches and/or maintain one lane open to traffic at all times.

49. SAFETY BARRICADES AND LIGHTS:

The Contractor shall furnish, erect and maintain all safety barricades, fences, red lights, flares, and watchmen necessary to properly protect all persons, animals, and property against injury or damages which result as a consequence of this work. In addition, all trenches should be closed or covered at the end of each workday. The Contractor shall barricade all work zones including but not limited to underground work, site work, building work, material storage areas and construction vehicles. These areas and elements shall be protected from the public by a six-foot minimum chain-link fence or approved substitute. Access to these fenced areas shall be controlled by locks with keys provided to the owner for their use through out the life of the Project.

All work shall be in accordance with the State of Ohio, ODOT 614 and 615 Specifications and related specifications and the "Ohio Manual of Uniform Traffic Control Devices for Streets and Highways" (hereinafter referred to as the OMUTCD). The OMUTCD shall be used when any and all unforeseen and anticipated traffic control problems arise.

50. SUBSTANTIAL COMPLETION AND GENERAL GUARANTY:

Neither the final certificate of payment nor any provision in the Contract Documents nor partial or entire occupancy of the premises by the Owner shall constitute substantial completion or an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to express warranties or responsibility for faulty materials or workmanship.

The Contractor shall remedy any defects in the work, material, and equipment and pay for any damage to work, materials, and equipment resulting there from, which shall appear within a period of one (1) year from the date of substantial completion and acceptance of the work, as designated on the Certificate of Substantial Completion and Guaranty of these specifications signed and executed by the Contractor and the Owner's Representative(s) unless a longer period is specified.

If at any time during the guaranty period a defect is observed, the Contractor shall be given written notice of said defect with reasonable promptness by the Owner. The Contractor hereby agrees to begin work on correction of the said defect within one (1) week from the posting of said notice. If the work is not commenced within the one (1) week period, the Owner may take any steps necessary to correct the defect himself.

In which case, the Contractor agrees to reimburse the Owner of the actual cost incurred as a result of his failure to perform. The actual cost shall include the cost of the work and any loss due to the delay in repairing the defect.

51. FINAL COMPLETION AND GENERAL GUARANTY:

Neither the final certificate of payment nor any provision in the Contract Documents nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to express warranties or responsibility for faulty materials or workmanship.

The Contractor shall remedy any defects in restoration and site improvements and pay for any damages resulting there from, which shall appear within a period of one (1) year from the date of final completion and acceptance of the work, as designated on the Contractor's Certificate of Final Completion and Guaranty of these specifications signed and executed by the Contractor and the Owner's Representative(s) unless a longer period is specified.

If at any time during the guaranty period a defect is observed, the Contractor shall be given written notice of said defect with reasonable promptness by the Owner. The Contractor hereby agrees to begin work on correction of the said defect within one (1) week from the posting of said notice. If the work is not commenced within the one (1) week period, the Owner may take any steps necessary to correct the defect himself.

In which case, the Contractor agrees to reimburse the Owner of the actual cost incurred as a result of his failure to perform. The actual cost shall include the cost of the work and any loss due to the delay in repairing the defect.

52. CONFLICTING CONDITIONS:

In the event of conflict, the governing order of contract shall be as delineated below; however, the special provision does not relieve the Contractor from his responsibilities as described in the General Conditions.

Governing Order

1. Permits from Other Agencies and as may be required by Law
2. Approved Change Orders
3. Contract Agreement
4. Addenda
5. Contractor’s Bid (Bid Form)
6. Supplementary General Conditions
7. General Conditions
8. Technical Specifications
9. Referenced Standard Specifications (ASCE, ASTM, AWWA, ODOT, etc.)
10. Drawings

Within the Contract Drawings the order of precedence is as follows:

1. Figures govern over scaled dimensions
2. Detailed drawings govern over general drawings
3. Addenda / Change Order drawings govern over any other drawings
4. Contract Drawings govern over standard drawings and shop drawings
5. CCWRD Standard Drawings govern over approved shop or setting drawings

53. NOTICE AND SERVICE THEREOF:

Any notice to any Contractor from the Owner relative to any part of this contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted, by certified or registered mail, to the said Contractor at his last given address, or delivered in person to said Contractor or his authorized representative on the work.

54. REQUIRED PROVISIONS DEEMED INSERTED:

Each and every provisions of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the contract shall forthwith be physically amended to make such insertion or correction.

55. PROTECTION OF LIVES AND HEALTH:

In order to protect the lives and health of his employees under the contract, the Contractor shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the contract.

In addition, the Contractor shall comply with all requirements of Occupational Safety and Health Agency (OSHA), all applicable safety regulations of the United States Environmental Protection Agency (USEPA), and the State of Ohio.

The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods; and for any damage which may result from their failure or their improper construction, maintenance, or operation.

56. EXISTING UTILITIES AND STRUCTURES:

The existence, location, and condition of utilities and structures, both above and below ground and within and out of the publicly designated right-of-way, shall be investigated and verified in the field by the Contractor before starting work. Excavation in the vicinity of such utilities and structures, both within and out of the publicly designated right-of-way, shall be done carefully and by hand if necessary. The Contractor shall protect all such utilities and structures, both marked and unmarked and within and out of the publicly designated right-of-way and be held responsible for damage to same. It shall be the responsibility of the Contractor to isolate, brace, support, sheet, etc. and protect the existing utilities from moving either horizontally or vertically. If such movement does occur due to the Contractor's operations, he shall repair the utility to the satisfaction of the utility owner at the Contractor's expense.

The Contractor shall give written notice to all owners of adjacent utilities, fixtures, and/or property, of his impending operations, but in no way shall such notice relieve the Contractor of his liability for damages to said utilities, fixtures, and/or property.

The Contractor shall contact the appropriate utility company at least 48 hours in advance of excavation on the vicinity of said utility. Field location shall be made by the utility or its authorized agency before any work is performed by the Contractor.

If at any time during work under this contract, an existing utility is damaged in any way, the Contractor shall immediately contact the appropriate governing entity and the Owner's Representative.

The Contractor shall take the proper steps necessary to insure the health, welfare, and safety of the public.

57. WAGE RATES:

See schedule attached to, or immediately following Page A-29.

The Contractor shall submit to the Owner's Representative, prior to submittal of the first estimate for partial payment, the applicable pages of the aforementioned wage rate schedule highlighting those classifications the Contractor intends to use on the project for the convenience of the Owner's Representative.

(a) If the project is financed wholly or in part by U.S. Government funds, there shall be paid each laborer or mechanic of the Contractor or subcontractor engaged in work on the project, not less than the hourly wage rate established by the U.S. Secretary of Labor regardless of any contractual relationship which may be alleged to exist between the Contractor or any subcontractor and such laborers and mechanics.

(b) Any wage determination required by State law are listed immediately following Page A-29; and in the case of any difference between them and the determinations of the U.S. Secretary of Labor as to the minimum rates fixed for any trade or occupation, the higher rate shall be the applicable minimum for such trade or occupation.

(c) If, after the award of the contract, it becomes necessary to employ any person in a trade or occupation not classified in the wage determination, such person shall be paid at not less than such rate as shall be determined by the officials mentioned above. Such approved minimum rate shall be retroactive to the time of the initial employment of such person in such trade or occupation. The Contractor shall notify the Owner of his intention to employ person(s) in trades or occupations not classified in sufficient time for the owner to obtain approved rates for such trades or occupation.

(d) The specified wage rates are minimum rates only, and the Owner will not consider any claims for additional compensation made by the Contractor because of payment by the Contractor of any wage rate in excess of the applicable rate contained in this contract. All disputes in regard to the payment of wages in excess of those specified in this contract shall be adjusted by the Contractor.

(e) Except as may be otherwise required by law, all claims and disputes pertaining to the classification of labor employed on the project under this contract shall be decided by the Owner's governing body or other duly designated official.

58. APPRENTICES:

Apprentices shall be permitted to work only under a bonafide apprenticeship program registered with a State Apprenticeship Council which is recognized by the Federal Committee on Apprenticeship, U.S. Department of Labor; or, if no such Council exists in a State, under a program registered with the Bureau of Apprenticeship, U.S. Department of Labor.

59. WORK PERIOD OTHER THAN NORMAL WORK WEEK:

Any work to be performed at any time, other than during the normal work week, which requires the presence of an inspector, shall not be performed without the knowledge and consent of the Owner's Representative, except in the case of emergency. In such instances, the Owner's Representative shall be informed of such work as soon as is reasonably possible. A normal work week is defined as Monday through Friday and exclusive of Government Holidays.

60. OVERTIME COMPENSATION:

This contract is subject to the applicable provisions of the Contract Work Hours Standards Act, Public Law 87-581, 87th Congress.

(a) Overtime Requirements:
No contractor or subcontractor contracting for any part of the contract work shall require or permit any laborer or mechanic to be employed on such work in excess of forty (40) hours in any work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half (1/12) times his basic rate of pay for all hours worked in excess of eight (8) hours in any calendar day or in excess of forty (40) hours in such work week, as the case may be.

(b) Violations; Liability for Unpaid Wages; Liquidated Damages:
In the event of any violation of the clause set forth in paragraph (a), the Contractor and any subcontractor responsible therefore shall be liable to any affected employee for his unpaid wages. In addition, such contractor or subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed, with respect to each individual laborer or mechanic employed in violation of the clause (a), in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of eight hours or in excess of forty hours in a work week without payment of the overtime wages required by the clause (a).

(c) Withholding for Unpaid Wages and Liquidated Damages:
The Owner may withhold, or cause to be withheld, from any moneys payable on account for work performed by the Contractor or subcontractor, the full amount of wages required by the contract and such sums as may administratively be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for liquidated damages as provided in clause (b).

(d) Insertion of Clauses in Subcontracts:
The Contractor agrees to insert the foregoing clauses (a), (b), and (c) this clause (d), and the following three paragraphs in all subcontracts.

Employees Covered:
Except as otherwise expressly provided in the Act, the provisions of the Act shall apply to all laborers and mechanics, including watchmen and guards, employed by any contractor or subcontractor in the performance of any part of the work contemplated by any such contract, and for purposes of this act, laborers and mechanics shall include workmen performing services in connection with dredging or rock excavation in any river or harbor of the United States or of any territory or of the District of Columbia, but shall not include any employee as a seaman.

Regulations:
The Regulation issued by the U.S. Department of Labor with respect to the Act shall apply to this contract.

Penalty:
Any contractor or subcontractor whose duty it shall be to employ, direct, or control any laborer or mechanic employed in the performance of any work contemplated by this contract who shall intentionally violate any provision of this Act, shall be deemed guilty of a misdemeanor, and for each and every such offense shall, upon conviction, be punished by a fine of not to exceed $1,000 or by imprisonment for not more than six months, or by both such fine and imprisonment, in the discretion of the court having jurisdiction thereof.

61. POSTING MINIMUM WAGE RATES:

The Contractor shall post at appropriate conspicuous points at the site of the project a schedule showing all determined minimum wage rates for the various classes of laborers and mechanics to be engaged in work on the project under this contract and all deductions, if any, required by law to be made from unpaid wages actually earned by the laborers and mechanics so engaged.

62. PAYMENT OF EMPLOYEES:

The Contractor and each of his subcontractors shall pay each of his employees engaged in work on the project under this contract in full (less deductions made mandatory by law) in cash and not less often than once each week less legally required deductions and also deductions made pursuant to the regulations prescribed under the so-called "Anti-Kickback Statute". Provided, that when circumstances render payment in cash infeasible or impracticable, payment by check may be effected upon consideration that funds are made available in a local bank and checks may be cashed without charge, trade requirements, or inconvenience to the worker.

63. "ANTI-KICKBACK STATUTE" AND REGULATIONS:

The Contractor and each of his subcontractors shall comply with the statutes, and with regulations issued pursuant thereto, of the State of Ohio and any other participating governmental body.

64. WAGE UNDERPAYMENT AND ADJUSTMENTS:

The Contractor agrees that, in case of underpayment of wages to any worker on the project under this contract by the Contractor or any subcontractor, the Owner shall withhold from the Contractor out of payments due, and amount sufficient to pay such worker the difference between the wages required to be paid under this

contract and the wages actually paid such worker for the total number of hours worked and that the Owner may disburse such amount so withheld by it for and on account of the Contractor to the employee to whom such amount is due. The Contractor further agrees that the amount to be withheld pursuant to this paragraph may be in addition to the percentages to be retained by the Owner pursuant to other provisions of this contract.

65. CONTRACTOR'S AND SUBCONTRACTOR'S PAYROLL:

The Contractor and each of his subcontractors shall prepare his payrolls and maintain adequate records to provide proof, if required, of compliance with applicable laws.

66. NO DISCRIMINATION IN EMPLOYMENT:

Contractor certifies and affirms it is an equal opportunity employer and shall remain in compliance with all state and federal civil rights and nondiscrimination laws, rules, regulations, and orders, including but not limited to those found under Ohio Revised Code Chapters 4112 and 153, during the term of this Agreement.

Contractor further agrees to insert the foregoing provision in all subcontracts for standard commercial supplies or raw materials.

67. OTHER PROHIBITED INTERESTS:

No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept, approve, or to take part in negotiating, making accepting, or approving any architectural, engineering, inspection, construction, or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part hereof. No officer, employee, architect, attorney, engineer, or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner of exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

68. EMPLOYMENT OF LOCAL LABOR:

The Contractor and each of his subcontractors shall, insofar as practicable, give preference in the hiring of workers for the project, to qualified local labor.

69. EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

Contractor shall comply with all measures for erosion and sediment control in accordance with the current "Clermont County Water Management and Sediment Control Regulations" and in accordance with the Plans and Work and Material Specifications and of these contract documents and all applicable regulations of the State of Ohio Environmental Protection Agency, the Clermont County Building Inspections Department, the Office of the Clermont County Engineer, and any other governmental agency. The Contractor shall maintain all erosion and sediment control measures throughout the execution of this contract and to the satisfaction of the Owner's Representative.

70. EMPLOYEES:

The Contractor shall employ only competent and skillful workmen to do the work. Incompetent, careless or disorderly workmen or foreman will not be permitted on the work and any such workmen or foremen will be discharged immediately by the Contractor upon the complaint of the Clermont County Park District and shall not be re-employed on the contract without the Clermont County Park District's consent.

71. CONSTRUCTION STILL PHOTOGRAPHY:

Prior to mobilization of any equipment or commencement of construction, the Contractor shall prepare preconstruction still photography which documents the condition of the project area. The Contractor shall also provide photographs of progress on a regular basis including, but not limited to, completed work, exposed work prior to cover, underground utilities, building utilities and framing.

72. PROTECTION OF SURVEYING MONUMENTATION:

The Contractor shall protect any and all property corner monumentation, both those shown on the Plans, and other monumentation encountered during construction. If the Contractor determines that certain monumentation will be disturbed, he shall hire the services of a Registered Surveyor, licensed to practice in the State of Ohio, to perform the necessary work to be able to reconstruct the location of the monumentation at the present location. All work described above shall not be a separate pay item but shall be paid for incidental to all project items.

SECTION C
WORK AND MATERIAL SPECIFICATIONS

DIVISION 09 - FINISHES

DIVISION 26 - ELECTRICAL

DIVISION 31 - EARTHWORK

DIVISION 32 - EXTERIOR IMPROVEMENTS

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

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. Related Sections: State of Ohio Department of Transportation (ODOT) Construction and Material Specifications.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Refer to Civil Specifications for drainage fill under slabs-on-grade.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture.

C. Shop Drawings: For steel reinforcement.

D. Material test reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
3. Preinstallation Conference. Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Broom Finish. Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II. Fly ash is not permitted. – All concrete shall have a Broom Finish with a Hardener Treatment.

B. Normal-Weight Aggregates: ASTM C 33, graded, 1-inch nominal maximum coarse-aggregate size.

1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will 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 C 494/C 494M, Type A. All concrete shall have a Broom Finish with a Hardener Treatment.

2.4 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.5 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete. Evaporation retarder shall not be used as a finishing aid.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, ASTM D 1752, cork or self-expanding cork or closed cell polyethylene foam for on-grade applications.

2.7 CONCRETE MIXTURES

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, according to ACI 301.

B. Proportion normal-weight concrete mixture as follows:

1. Footings:

    a. Minimum Compressive Strength: 3000 psi at 28 days.
    b. Maximum Water-Cementitious Materials Ratio: 0.5.
    c. Slump Limit: 4 inches for conventional concrete, 8 inches for concrete with a verified slump of 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus one inch.
    d. Air Content: 6 percent, plus or minus 1.5 percent.

2. Slab-on-grade, Exterior:

    a. Minimum Compressive Strength: 4500 psi at 28 days.
    b. Maximum Water-Cementitous Materials Ratio: 0.40.
    c. Slump Limit: 4 inches for conventional concrete, 7 inches for concrete with a verified slump of 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus one inch.
    d. Air content: 6 percent, plus or minus 1.5 percent.

e. All concrete shall have a Broom Finish with a Hardener Treatment

3. Slab-on-grade, Interior:

a. Minimum Compressive Strength: 4000 psi at 28 days.
b. Maximum Water-Cementitous Materials Ratio: 0.45.
c. Slump Limit: 4 inches for conventional concrete, 7 inches for concrete with a verified slump of 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus one inch.
d. Air content: Do not allow air content of troweled finished floors to exceed 3 percent.

e. All concrete shall have a Broom Finish with a Hardener Treatment.

4. Concrete Walls:

a. Minimum Compressive Strength: 4500 psi at 28 days.
b. Maximum Water-Cementitous Materials Ratio: 0.40.
c. Slump Limit: 4 inches, plus or minus one inch.
d. Air content: 6 percent, plus or minus 1.5 percent.

2.8 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2. All concrete shall have a Broom Finish with a Hardener

Treatment. PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 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. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. 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 concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: 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.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

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

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch.

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. All concrete shall have a Broom Finish with a Hardener Treatment.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing. Evaporation retarder shall not be used as a finishing aid.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing 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.

    a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
5. Hardener Treatment.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

1. Testing Services: Tests shall be performed according to ACI 301.

3.12 BASIS OF PAYMENT

A. Payment will be made to the contractor at the unit price bid, complete in place.

END OF SECTION 03 30 00

SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Concrete unit masonry work, including but not limited to the following:

1. Reinforced concrete unit masonry walls.

B. Specific items included in this Section include the following:

1. Concrete unit masonry.
2. Mortar and grout.
3. Masonry joint reinforcement.
4. Ties and anchors.
5. Embedded flashing.
6. Miscellaneous masonry accessories.
7. Placement of steel lintels provided under Section 05 50 00 - Metal Fabrications.

C. Work installed under this Section, but materials or products furnished under the following Divisions or Sections:

1. Section 03 20 00 - Concrete Reinforcing.
2. Installation of loose lintels indicated on the Drawings shall be included under the Work of this Section.
3. Section 06 10 00 - Rough Carpentry.
4. Section 08 11 13 - Hollow Metal Doors & Frames
5. Section 08 51 13 - Aluminum Windows.

D. Related Sections:

1. Section 03 30 00 - Cast-In-Place Concrete: Reinforcing.
2. Section 06 10 00 - Rough Carpentry.
3. Section 07 90 00 - Joint Protection.
4. Section 08 11 13 - Hollow Metal Doors & Frames
5. Section 08 51 13 - Aluminum Windows.

1.2 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 SUBMITTALS

A. Refer to Section 01 32 19 - Submittals: For submittal requirements.

B. Submit manufacturer’s certification of each type of masonry unit required certifying that units supplied for the work comply with specification requirements, including type, grade, curing, moisture content, and performance requirements.

1. Each type of masonry unit required.

E. Submit compression test results from an independent testing laboratory showing the compressive strength of each type and size of concrete masonry units delivered to the construction site during the first fifteen days of masonry construction. Submit additional tests from each type and size of concrete masonry units for each 5,000 square feet of concrete masonry wall constructed. The independent testing laboratory is to select units to be tested from materials stockpiled on the project site.

F. Submit four full-sized samples of each type and color of face masonry units to illustrate color, texture, and extremes of color range for approval by the Architect before units are submitted to the job site.

1. Colored mortar samples showing the full range of colors available.

G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used during weather where all temperatures will drop below 40 degrees F.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes, specifications, and standards, except as otherwise shown or specified:

1. ACI 530-95/ASCE 5-95 Building Code Requirements for Masonry Structures.
2. ACI 530.1-95/ASCE 6-95 Specifications for Masonry Structures.
3. ASTM C140-75 (R 1988) Standard Methods of Sampling and Testing Concrete Masonry Units.

B. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 “Specifications for Masonry Structures”, except as otherwise indicated. Revise ACI 530.1/ASCE 6 to exclude Sections 1.4 and 1.7; Parts 2.1.2, 3.1.2, and 4.1.2; Articles 1.5.1.2, 1.5.1.3, 2.1.1.1, 2.1.1.2, and 2.3.3.9, and to modify Article 2.1.1.4 by deleting requirements for installing vent pipes and conduits built into masonry.

C. Concrete Unit Masonry Construction: Comply with National Concrete Masonry Associates (NCMA) “TEK Bulletins” and as specified:

1. NCMA-TEK 3-2 Grouting for Concrete Masonry Walls.
2. NCMA-TEK 18-1 Concrete Masonry Prism Testing.
3. NCMA-TEK 18-3 Quality Assurance.

D. Obtain masonry units from a single manufacturing source to assure uniform texture and color, for each type required, for each continuous area and visually related areas.

E. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

F. Methods and Workmanship: In accordance with NCMA TEK Bulletins unless otherwise specified herein.

1.5 MOCKUP

A. Prior to installing unit masonry, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work.

B. Build mock-ups for the following types of masonry in sizes approximately 48 inches long by 48 inches high by full thickness, including face and back-up wythes as well as accessories.

1. Provide sample panel mock-ups of each type of masonry to be used as an exterior facing in the work.
2. Include specified masonry units, mortar and accessories and using materials, bond and joint tooling required for the work. Panel shall indicate color range and texture of masonry units, bond, mortar joints, and workmanship proposed for the completed work.
3. Acceptance of mock-ups is for color, texture, and blending of masonry units; relationship of mortar and sealant to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other materials and construction qualities.

C. Obtain Architect's acceptance of the mock-ups before start of masonry work. When accepted, mock-ups will demonstrate minimum standard for the work. Do not remove panels until masonry work is completed or until removal is authorized by the Architect.

D. Interior Masonry Sealer: Test a minimum 4 foot by 4 foot area on each type of concrete unit masonry surface. Use the manufacturer's application instructions. Let test area protective treatment cure before inspection. Keep the test panels available for comparison throughout the application of the sealer.

1.6 PRE-INSTALLATION CONFERENCE

A. Prior to the installation of the masonry and associated work, meet at the project site with the installer, the installer of each component of associated work, the installers of other work in and around masonry (including windows), the Architect and other representatives directly concerned with performance of the Work, including (where applicable) insurers, test agencies, product manufacturers, governing authorities, and the Owner. Record (by masonry contractor) the discussions of the conference and the decisions and agreements (or disagreements) reached and furnish a copy of the record to each party attending. Review foreseeable methods and procedures related to the masonry work, including, but not limited to, the following:

1. Review project requirements (Drawings, Specifications, and other Contract Documents), including sample panels, job mock-ups, and cleaning procedures.
2. Review required submittals, both completed and yet to be completed.
3. Review status of substrate work, including drying, structural loading limitations, and similar considerations.
4. Review availability of materials, tradesmen, equipment, and facilities needed to make progress and avoid delays.
5. Review required observation, testing, certifying, and accounting procedures.
6. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions, including the possibility of temporary enclosures.
7. Review regulations concerning code compliance, environmental protection, health, safety, fire, and similar considerations.

4. Review procedures needed for protection of masonry during the remainder of the construction period.
5. Consider each party's expert judgment, as advanced in the interest of successful completion of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry units which are at least 14 days old and which have been properly cured to the specified moisture content (40 percent of maximum absorption). Questionable masonry will be tested and shipment rejected if the average moisture content is found to exceed specification limits.

B. Store masonry in a dry place, off the ground on prepared platforms in a manner to promote air circulation through and around units.

1. Carefully stack all masonry units, and protect with shed or tarpaulin.
2. Protect anchors, ties, and reinforcement from elements.
3. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.

C. Handle all masonry units carefully at all times. Do not build units with chipped edges, spalls, or other damage to their appearance into the Work.

1.8 PROJECT CONDITIONS

A. Protect partially completed masonry against weather, when Work is not in progress, by covering top of walls with strong, waterproof, nonstaining membrane. Extend membrane at least 2 feet down both sides of walls and anchor securely in place.

B. This structure is designed to be self-supporting and stable after the building is fully completed. Protect masonry walls against wind damage by bracing as required until support of walls is integral with the completed building structure. This includes the addition of whatever temporary bracing, guys, or tie-downs that might be necessary. Such materials are not shown on the Drawings. If applied, they shall be removed as conditions permit, and shall remain the Contractor's property.

1. Safety: It is solely the Contractor's responsibility to follow all applicable safety codes and regulations governing this Work.

C. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

D. Hot and Cold Weather Precautions: Comply with BIA Technical Notes 1A and NCMA TEK 3-1A (1995) requirements and the following:

1. Do not use frozen materials or materials mixed or coated with ice or frost.
2. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing.
3. Protect completed masonry work against freezing after laying.

E. Do not use metal reinforcements or anchors coated with loose rust or other coating, including ice, which will reduce or destroy bond.

F. Do not apply uniform design floor or roof load for at least 24 hours. Do not apply concentrated load for at least three days.

G. Dry brush clean exposed masonry with bristle brushes at end of each day's work. Remove mortar spatters and joint ridges.

H. Split masonry coursing at heads and sills of openings and cut concrete masonry coursing less than 4 inches in height is not permitted.

1.9 EXTRA MATERIALS

A. Furnish, fabricate, and place, additional masonry reinforcement and grout in quantity indicated on structural drawings, as directed by the Architect.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Manufacturers:

1. Wellnitz
2. Oberfields
3. Schory Cement Products
4. Sidley
5. Proposed Equals: Refer to Instructions To Bidders, Article 2.5.

B. Joint Reinforcement, Ties, and Anchors: Provide products of one of the following:

1. Dur-O-Wal, Inc.
2. Heckman Building Products, Inc.
3. Hohmann & Barnard, Inc.
4. Masonry Reinforcing Corp. of America.
5. National Wire Products Industries.
6. Proposed Equals: In accordance with the Instructions To Bidders, Article 2.5.

C. General: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sash, sills, control joints, headers, bonding and other special conditions.
2. Provide bullnose edged units for outside corners.
3. Manufacturer: Obtain masonry units from one manufacturer of uniform texture and color for each kind required, for each continuous area and visually related areas.
4. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.

2.2 CONCRETE MASONRY UNITS

A. Concrete Masonry Units: All CMU on this Project to have minimum compressive strength of 2,170 psi on net area).

1. Manufacturer: Shall be a member of the National Concrete Masonry Association.
2. Size: Manufacturer's standard units with face dimensions of 15-5/8 by 7-5/8 inches (actual).
3. Special Shapes: Provide, where shown and where required, lintels, corners, jambs, sash, control joints, headers, bond beams, bullnose, and other special conditions.
4. Fire Resistance: Furnish units with specified fire resistance classification, where indicated on Drawings, based on the equivalent thickness method to determine fire-resistance classification as published in the National Concrete Masonry Association's TEK 7-1 (Fire Safety with Concrete Masonry).
5. Integral Water Repellent: Provide integral water repellent at all exterior CMU, complying with ASTM E514 wind driven rainwater permeance Class E rating.
   a. Dryblock: Grace Construction Products, Cambridge, Maryland.
   b. Rheomix - Rheopel: Master Builders, Inc., Cleveland, Ohio.
   c. Block Plus W10: Addiment Inc., Atlanta, Georgia.
   d. Acme-Shield: Acme-Hardesty Co., Blue Bell, Pennsylvania.
6. Bond beam units shall be such that where two reinforcing steel bars are required in the bond beams, bars may be located not greater than 2-5/8 inch from both faces of the unit. Bond beam units which do not allow the two bars to be separated and to be within 2-5/8 inch of each face will not be acceptable.

B. Load-Bearing CMU: Provide units complying with ASTM C90, Type I or II, with a minimum compressive strength of 2,170 psi on the net section.

1. Normal Weight Units: ASTM C33 concrete aggregates for a dry net weight of not less than 125 pounds per cubic foot. Strength shall be as indicated above.
2. Curing: Cure units to comply with ASTM C90, Type I or II.

C. Standard Texture

1. Standard texture with integral color as selected by architect from manufacturer's full range.

D. Splitface Texture

1. Splitface texture with integral color as selected by architect from manufacturer's full range.

2.3 REINFORCING STEEL

A. Reinforcing Steel: Type and sizes as specified on Drawings and in Section 03 30 00 - Cast-In-Place Concrete, meeting the requirements of ASTM A615. Provide bars free of rust and loose scale at time of delivery.

2.4 MASONRY JOINT REINFORCEMENT

A. General: ASTM A951 and as follows:

1. Mill galvanized, carbon-steel wire for interior walls.
2. Hot-dip galvanized, carbon-steel wire for exterior walls, minimum 1.5 ounce coating, per ASTM A153, Class B-2.
3. Wire Size for Side and Cross Rods: W1.7 or 0.048-inch diameter.
4. Provide lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.

B. For single-wythe masonry, provide ladder type with single pair of side rods and cross rods spaced not more than 16 inches on center.

C. For multiwythe masonry provide types as follows:

1. Ladder type with perpendicular cross rods spaced not more than 16 inches on center 1 side rod for each face shelf of hollow masonry units more than 4 inches in width, plus 1 side rod for each wythe of masonry 4 inches or less in width.

2.5 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A82; with ASTM A153, Class B-2 coating.

C. Steel Sheet, Galvanized after Fabrication: ASTM A366 cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A153.

D. Steel Plates, Shapes, and Bars: ASTM A36.

E. Anchoring Devices: Provide strap anchors, ties, inserts, bolts, and rods of type and size required.

1. Masonry-to-Masonry: Strap anchors 1/4-inch by 1-1/4 inches by 24 inches galvanized steel with bent ends.

a. Standard: Dur-O-Wal or one of the following: “301Z” Heckman, “272 Rigid Steel Anchor” Hohmann & Barnard, Inc., #344 Rigid Partition Anchor, or approved equal.

2. Finish: ASTM A153, 1.5 ounce hot-dip galvanized finish for exterior walls; standard mill finish for remaining areas.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.187-inch steel wire, hot-dip galvanized after fabrication.

1. Provide units with either two loops or four loops as needed for number of bars indicated.
2. Reinforcing Bar Positioners:

a. Dur-O-Wal, Inc.
b. Heckman Building Products, Inc.
c. Hohmann & Barnard, Inc.

G. Anchor Bolts: Steel bolts complying with ASTM F1554, Grade A36; with ASTM A563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A153, Class C; of diameter and length indicated and in the following configurations:

1. Headed bolts.
2. Nonheaded bolts, bent in manner indicated.

H. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing, per ASTM E488, conducted by a qualified independent testing agency.

1. Type: Expansion anchors.
2. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 for bolts and nuts; ASTM A666 or ASTM A276, Type 304 or 316, for anchors.

I. Rigid Anchors: Where masonry is to be rigidly anchored to structural steel beams, provide galvanized steel straps, bars or rods welded to the steel beam and extending into the mortar joint. Straps shall be not less than 14-gauge in thickness. Bars and rods shall be not less than 1/4-inch in diameter.

J. Flexible Anchors: Where masonry is to be laterally supported from structural steel, while permitting only vertical movement or both vertical and horizontal movement, provide flexible anchors consisting of 2 different components as follows:

1. Weld-On Anchors: Shall be formed straps of 12-gauge galvanized steel or formed rods of 1/4-inch plain steel with 3/8-inch offsets and 4-inch adjustment for ties specified below. Anchors shall be continuous wherever possible.
2. Flexible anchor ties shall be one of the following:

a. Web Ties or Beam Ties: Shall be 3/16 inch galvanized steel wire, ASTM A82, 12-inches long with width being approximately 2 inches less than nominal wall thickness. Provide ties with blunt end when used with strap anchors, and provide ties with tapered end when used with rod anchors. This type tie shall permit only vertical movement and shall be installed parallel to masonry walls that abut steel columns. Products of the following manufacturers are acceptable:

1) “315” or “317” Weld on Anchors with “318” Web Ties: Heckman Building Products, Inc.
2) “315-B” or “317-B” Weld on Anchors with “316” Triangular Ties: Heckman Building Products, Inc.
3) “359” or “359-C” Weld on Anchors with “302W” Web Ties: Hohmann & Barnard, Inc.
4) “359F” or “359-C” Weld on Anchors with “302W” Web Ties: Hohmann & Barnard, Inc.
5) “1000” Weld on Anchors with “1200” Web Ties: Masonry Reinforcing Corp. of America.

0) "1001" Weld on Anchors with "1201" Web Ties: Masonry Reinforcing Corp. of America.
1) "AA401G" Weld on Anchors with "AA400W/T Type A" Web Ties: AA Wire Products Company.
2) "AA401B" Weld on Anchors with "AA400W/T Type B" Web Ties: AA Wire Products Company.

b. Triangular Ties: Shall be 3/16 inch galvanized steel wire, ASTM A82, lengths as required to extend to within 5/8 inch of opposite face of masonry. Closed end shall be 1 inch wide, and split-end opening shall be 1/2 inch. This type tie shall permit both vertical and horizontal movement and shall be installed where masonry bypasses steel columns, and where masonry is parallel and adjacent to steel beams and joists.
c. Flexible Anchors: Where masonry is to be laterally supported from cast-in-place or precast concrete, provide 22 gauge galvanized dovetail slots with 3/16-inch diameter galvanized triangular ties.

2.6 EMBEDDED FLASHING MATERIALS

A. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of 5 ounces per square foot sheet copper bonded with asphalt between 2 layers of glass-fiber cloth.

1. Application: Use only where flashing is fully concealed in masonry.
2. Copper-Laminated Flashing:

a. Copper Fabric: AFCO Products, Inc.
b. Copper Fabric Flashing: Sandell Manufacturing Co., Inc.
c. York Copper Fabric Flashing: York Manufacturing, Inc.

B. Surface-Mount and Thru-Wall Flashing:

1. Hohman & Barnard TeXtroflash Flashing, self-adhering flashing, 40 mill, non-asphalt composite membrane with clear adhesive.

2.7 MASONRY ACCESSORY MATERIALS

A. Preformed Expansion Joints: Styrene butadiene rubber compound conforming to ASTM D2000, Designation 2AA-805, regular design to fit standard sash block, with a durometer hardness of 80 when tested in accordance with ASTM D2240. Manufacturer: Dur-O-Wal "Rapid Control Joint®", AA Wire Products "AA1000 Titewall", Vinylex Corp. "Vinylex Type CJ-A", or approved equal.

B. Weep Vents:

1. Round plastic weep holes with stainless steel screen inserts with extended wicks #341w/s provided by Hohmann and Barnard, Inc., or approved equal.
2. Rectangular air vents for use at top of wall #QV-Quadro-Vent by Hohmann and Barnard, Inc. or approved equal.

C. Preformed Control Joint Filler:

1. Provide closed cell sponge neoprene expansion joint filler conforming to ASTM D1056, Type 2, Class A, Grade A, oversized 35 percent to joint width.

2.8 AIR BARRIER

A. Manufacturers

1. Carlisle (Basis of Design)
2. TW
3. Proposed Equals: Refer to Instructions to Bidders, Article 2.5.

B. Materials

1. Barriseal - S, or Barriseal – R, spray applied or roller applied Air Barrier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which masonry is to be installed and notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

1. Examine surfaces which are to support masonry work to assume completion to proper lines and grades. Remove all dirt, laitance, loose aggregates, and other deleterious material.
2. Examine rough-in and built-in construction to verify actual locations prior to installation.

B. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to masonry installer.

C. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Remove dirt, ice, loose rust, and scale from metal components prior to installation.

B. Protect base of exterior walls from splattering of mortar, soil, mud, and other materials that might stain the masonry up to 4 feet above grade with a membrane similar to 45 mil EPDM or plywood sheathing material. Maintain protection for the entire duration of the project.

C. Protect all sills, ledges, and projections from droppings of mortar. Protect doorjambs and corners from damage during masonry construction.

D. Verify that initial rate of absorption of brick is less than 1 gram per square inch per minute. Brick with absorption rates in excess of this amount shall be wetted with clean water 24 hours prior to placement until units are nearly saturated, and shall be surface dry when laid. During freezing weather, sprinkle units that require wetting with warm or hot water just before placement.

3.3 INSTALLATION - GENERAL

A. Thickness: Build masonry construction to the full thickness shown, except, build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

B. Build chases and recesses as shown and as required for the work of other trades. Provide not less than 8 inches of masonry between chases or recess and jamb of openings, and between adjacent chases and recesses.

C. Cut masonry units with motor-driven saw designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.

D. Do not use frozen materials mixed or coated with ice or frost. For masonry which is specified to be wetted, comply with the BIA recommendations. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing.

3.4 PLACING AND BONDING

A. Build composite walls and other masonry construction to the full thickness shown. Note rustication coursing.

B. Lay solid masonry units in full bed of mortar, with full head and collar joints, uniformly jointed with other work. Use full size units without cutting whenever possible. Provide 100 percent solid units where webs or cores would be exposed.

C. Lay hollow masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in first course on footings and foundation walls, and adjacent to cells or cavities to be filled with grout. Fill collar joints between wythes solid with mortar in exterior walls of multiple wythe construction.

D. Mix units for exposed brick infills areas from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

E. Buttering corners of joints or excessive furrowing or mortar joints are not permitted.

F. Remove excess mortar as work progresses.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, after mortar has started to harden, remove mortar and replace with fresh mortar.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Leave openings for equipment which is to be installed later in construction. After installation of equipment, complete masonry work to match work adjacent to the openings.

J. Cut neatly around pipes, conduits, and ducts. Fill cracks with mortar.

K. Isolate top joint on non-loadbearing masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler, and seal.

E. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise shown.

F. Rake out mortar in preparation for application of caulking or sealants where required.

3.5 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Lay-up walls plumb and true and with courses level, accurately spaced, within specified tolerances, and coordinated with other work. Do not wedge partitions tight against structural ceiling or beams, but provide a caulk or insulation filled joint between masonry and the structural roof deck, structural steel framing or structural floor deck at nonrated conditions. At rated walls, provide firestopping.

D. Lay concrete masonry units in running bond unless otherwise noted with vertical joint in each course centered on units in courses above and below. Provide coursing as indicated on Drawings.

1. Form concave tooled mortar joints in all interior exposed work. Form raked, tooled mortar joints in all exterior exposed work.
2. Compress and cut joints flush for masonry walls which are below grade, concealed, or covered by other materials.
3. Provide 3/8-inch joint widths, except for minor variations required to maintain bond alignment.
4. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

E. Align unit cells or cores that are to be grouted.

F. Bond and interlock each course of each wythe at corners. Do not use units with less than 4 inches of horizontal face dimensions at corners or jambs.

1. Provide special coursing where indicated.
2. Provide uniform color blending in walls of exposed brick or concrete masonry units to avoid patchy effect.
3. Stop horizontal runs at end of workday by racking back 1/2 unit length in each course.
4. When joining fresh masonry to set or partially set masonry, remove loose unit and mortar, and clean and lightly wet exposed surface of set masonry prior to laying fresh masonry.

G. Stopping and Resuming Work: Step back 1/2 masonry unit length in each course; do not tooth. Clean exposed surfaces of set masonry, and remove loose masonry units and mortar prior to laying fresh masonry.

3.6 BUILT-IN WORK

A. As work progresses, build in metal frames, anchor bolts, bearing plates, reinforcement, inserts, sleeves and other items furnished by other sections. Form chases and openings required for other work.

B. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod grout into core.

C. Provide solid masonry bearing for all lintels, beams, and load-bearing members. Provide solid masonry units or hollow units filled solid.

D. Build in items plumb and level.

E. Build in work of other trades without weakening or defacing masonry.

F. Obtain exact sizes of openings for ducts, grilles, louvers, piping, and other work furnished by other trades and properly build around same.

G. Machine cut masonry neatly for installation of outlet boxes and similar equipment.

H. Locate pipe and conduit in walls accurately so as not to weaken the strength of the masonry.

I. Install adjustable hollow metal frame anchors, locating anchors on jambs in horizontal bed courses near the top and bottom of each frame and at intermediate points not over 24 inches apart. Draw anchors tight and fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

1. Rake joints around exterior side of exterior hollow metal doorframes for sealant.
2. Protect concealed faces of doorframes in exterior masonry walls, using fibered asphalt emulsion coating. Apply over shop primer approximately 1/8 inch thick and allow to dry before handling.
3. Where hollow metal frames do not wrap around masonry jambs and heads, rub exposed corners of block to remove sharp, irregular edges.
4. Fill cores in hollow concrete masonry units with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

J. Provide anchoring devices of the type indicated and specified for anchoring masonry work. Provide open space not less than 1/2-inch width between masonry and structural member. Keep space free of mortar or other materials.

3.7 CAVITY WALLS

A. Lay wythes of cavity walls concurrently except where pintle and eye type horizontal joint reinforcing is shown. At no time shall a wythe be more than 16 inches higher than any other wythe being constructed concurrently.

B. Where pintle and eye joint reinforcement is shown, concrete masonry wythes may be laid up full height separate from facing wythe.

C. Keep cavity clean of mortar droppings by suspending by wires a wooden strip the width of the air space. Strip shall be lifted as each course of joint reinforcement is laid in facing wythe. Mortar

shall be placed so that excess is not pressed into cavity air space as facing wythe is laid-up. Bevel mortar back from cavity face of brick to prevent mortar from being pressed into cavity as brick is tapped into position. Install cavity mortar protection in cavity above thru wall flashing and where indicated.

L. Tie exterior wythe to back-up with continuous horizontal joint reinforcing embedded in mortar joints at not more than 16 inches on center vertically.

M. Provide concealed flashing around entire perimeter at base of walls in first course above grade. Provide concealed flashing and cell vents above exterior wall openings and within exterior walls that project above adjacent lower roof(s); and at all locations shown on the Drawings and at any other locations as required to complete the integrity of system. Install as specified hereinafter. Flashing joints shall be made by lapping a minimum of 4 inches and coating the contacting surfaces with mastic.

N. Install insulation horizontally within cavity against inner wythe. Install between wall reinforcing, seal edges and fit tight around obstructions across the cavity. Use adhesive to secure insulation flush against inner wythe.

O. Fill all cracks and open gaps in insulation with sealant.

P. Provide cell vent in exterior wythe of cavity wall located immediately above ledges and flashing spaced 24 inches on center, unless otherwise shown.

Q. Provide sheet metal flashing drip for elastomeric flashing.

3.8 HORIZONTAL JOINT REINFORCEMENT

A. Provide continuous horizontal joint reinforcement in all unit masonry walls as follows:

1. Place reinforcing spaced at 16 inches on center vertically, full height of wall and every block course shown on the Drawings, except at control/expansion joints.
2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 24 inches each side of opening.
3. Place joint reinforcement continuous except at control joints.
4. Provide continuity at corners and wall intersections by use of prefabricated “L” and “T” sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, pipe enclosures and other special conditions.
5. Lap joint reinforcement ends minimum 6 inches at splices, and provide preformed corners.

B. Install reinforcing steel and concrete grout specified in Section 03 30 00. Support and secure reinforcing bars from displacement. Comply with drawing details for steel size and spacing. Maintain position of reinforcing within 1/2 inch of dimensioned position.

C. Embed anchors attached to structural steel members and grout solid.

3.9 LINTELS

A. Install loose steel lintels over window openings, door openings, and at other locations shown. Do not bond masonry work to bearing support ends of lintels.

3.10 MASONRY FLASHINGS

A. Install embedded (concealed) flashing and cell vents in masonry at shelf angles, lintels, ledges, in the first course above grade and at other obstructions to the downward flow of water in the wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing.

C. Carefully place flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive/sealant/tape as recommended by flashing manufacturer before covering with mortar. Carefully fit flashing around projections, columns, walls, etc. Install flashing continuous around inside and outside corners using prefabricated corner boots where possible. End laps shall be a minimum of 6 inches and side laps 4 inches all sealed with manufacturers recommended mastic.

D. Form flashing to correct profile without wrinkles or buckles, and protect from punctures and tears during installation. Install flashing so as to force any moisture entering the wall to the outside as follows:

1. Extend flashing to outside face of wall and terminate flush with wall.
2. Provide concealed flashing in first course above grade or where wall extends above roof and is exposed. Coordinate with roof termination.
3. Provide cell vents in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing.
4. Provide cell vents (ventilator) at the top of the cavity. Space approximately 32 inches on center.

   Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

E. Install flashing as follows:

1. At multiwythe masonry walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through inner wythe and turn flashing up approximately 2 inches, unless otherwise indicated.
2. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at lease at 8 inches, and behind air-infiltration barrier or building paper.
3. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.
4. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
5. Install metal drip edges beneath flashing at exterior face of wall. Stop flashing 1/2 inch back from outside face of wall and adhere flashing to top of metal drip edge.

F. Provide end dams at least 4 inches high where flashing is not continuous at wall openings, building expansion joints, and where masonry meets adjacent wall materials and systems. Install flashing in veneer walls carrying flashing up face of sheathing at least 8 inches and behind building felt paper. Bond and seal end dam flashing to wall flashing and seal end dam flashing against end brick.

G. Extend flashing continuous around corners. Cut, overlap and seal all corner flashing. Extend flashing continuous across vertical control joints. Lap flashing at joint a minimum of 6 inches and seal with joint sealant.

H. Install concealed flashing in accordance with BIA Technical Notes 7 and SMACNA "Architectural and Sheet Metal Manual" Plates 52 and 53. Extend flashings beyond edge of lintels and sills at least 4 inches. Extend flashing vertically at least 8 inches and build into or anchor to back-up for a complete watertight installation. Seal top edge of flashing anchored to back-up sheathing and stud framing.

I. Install weep vents in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:

1. Space weep holes 24 inches on center.

J. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.11 REINFORCED CONCRETE MASONRY

A. Grout filled or steel reinforced concrete block masonry foundations or masonry walls shall be reinforced and grouted as detailed on approved shop drawings.

B. Grout with 3,000-psi grout (slump 6 to 10 inches) in the block cavities, completely fill each cavity with homogenous grout, extending from the lowest course to the top of the reinforced portion of the foundation or wall. Mortar shall not be used as grout for CMU.

C. Verify that locations of bond beams, pilasters, and other grouted components are as indicated on Drawings.

D. Reinforce bond beams as indicated. Comply with drawing details for steel size, quantity, and spacing.

E. Lap splices minimum 24 bar diameters. Capping devices and centering clips shall be spaced vertically such that every section of vertical reinforcing steel bar is restrained by 2 clips or devices, one near its top and one near its bottom. Maintain position within 1/2 inch of dimensioned position.

F. The low-lift grouting procedure shall be used as described in the Drawings and in NCMA TEK 3-2 Grouting for Concrete Masonry Walls. Maximum height of grouting shall be 4 feet. Work grout into masonry cores and cavities to fill all voids.

G. At bearing locations, fill all masonry cores solid with coarse grout fill to dimensions indicated on the Drawings.

3.12 CONTROL JOINTS

A. Construct control joints where shown. Do not continue horizontal joint reinforcement through control and expansion joints.

1. If not shown on Drawings, provide vertical control joints at intervals not more than 32 feet on center for ASTM C90, Type I units and 24 feet on center for ASTM C90, Type II units, and at all offsets, returns, openings, and intersections with dissimilar materials and as follows to prevent cracking:
   d. At change from wall setting on foundation to wall setting on floor slab.
   e. At change from exterior wall to interior wall.
   f. At wall setting on floors that cross-floor construction and control joints.
   g. At columns with masonry walls.
   h. At changes in wall thickness.

2. Stop joint reinforcement bars on either side of control joints. Extend reinforcing bars in bond beams continuously through control joints and sleeves for bond break 18 inches each side of joint.
3. Install control joints in concrete masonry units with prefabricated shear key.
4. At end of lintel bearing on one end of openings less than or equal to 6 feet 4 inches and at both ends of openings greater than 6 feet 4 inches.

B. Install preformed control joint device in continuous lengths. Rake out mortar in preparation for sealants. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joint in accordance with Section 07 90 00 - Joint Protection, for sealant performance.

3.13 EXPANSION JOINTS

A. Construction Movement Joints (Control and Expansion):

1. Provide vertical expansion, control, and isolation joints in masonry where shown. Build in related masonry accessory items as the masonry work progresses. Rake out mortar in preparation for application of caulking and sealants. Caulking and sealing are included under the Work of Section 07 90 00 - Joint Protection.
2. Control Joint Locations in CMU: Provide vertical control joints in CMU where called for on the Drawings, at intervals not more than 32 feet on center for ASTM C90, Type I units and 24 feet on center for ASTM C90, Type II units, and at all offsets, returns, openings, and intersections with dissimilar materials and as follows to prevent cracking:

   a. At change from wall setting on foundation to wall setting on floor slab.
   b. At change from exterior wall to interior wall.
   c. At wall setting on floors that cross-floor construction and control joints.
   d. At columns within masonry walls.
   e. At changes in wall thickness.
   f. Stop joint reinforcement bars on either side of control joints. Extend reinforcing bars in bond beams continuously through control joints and sleeves for bond break 18 inches each side of joint.
   g. Install control joints in concrete masonry units with prefabricated shear key.
   h. At end of lintel bearing on one end of openings less than or equal to 6'-4" and at both ends of openings greater than 6'-4".

3. Expansion Joint Locations in Brick: Provide vertical expansion joints in brick masonry at all offsets, returns, openings, intersections with dissimilar materials, and elsewhere as shown on Drawings and indicated hereinafter, and at nor more than 24 feet on center. Provide horizontal expansion joints by placing a continuous 3/8 inch pad below shelf angles, where indicated.

a. At expansion joints shown in limestone or precast concrete panels laid into the brick wythe.
b. At one jamb of openings 12 feet or wider.
c. Form open joint of width indicated but not less than 3/8 inch for installation of preformed expansion joint filler, and sealant and backer rod specified in Section 07 90 00 - Joint Protection. Maintain joint fee and clear of mortar.

3.14 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, and sleeves. Coordinate with other Sections of work to provide correct size, shape, and location.

B. Obtain Architect's approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 REPAIR

A. Remove and replace units which are loose, chipped, broken, stained, or otherwise damaged. Provide new masonry units to match adjoining units and install in fresh mortar pointed to eliminate evidence of replacement.

1. Provide new units to match adjoining units that cannot be successfully patched and install in fresh mortar, pointed to eliminate evidence of replacement.
2. Provide a 100 square foot area of patched CMU for Architect's review. Do not proceed with patching until area is approved. Wall shall appear uniform from a distance of 5 feet. If masonry units are colored, coordinate blend with unit manufacturer.

B. Pouring: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints at corners, openings, and adjacent work to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.

C. At completion of masonry work, cut out any defective joints or holes in exposed masonry and repoint with fresh mortar, tooling to match adjacent joints.

D. Dry brush masonry surface after mortar has set at the end of each day's work and after final pointing. Remove excess mortar and mortar smears.

3.16 CLEANING

A. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on area as indicated by Architect and allow test area to dry 3 to 7 days. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry. Record methods.
3. Cover adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clean water.

5. Clean exposed brick masonry surfaces by means of bucket and brush hand cleaning methods as recommended by BIA Technical Notes 20 “Cleaning Brick Masonry, Nov. 1990”.

   a. Remove efflorescence in accordance with brick manufacturer’s recommendations. Cleaning agents may be used only with approval of masonry unit manufacturer. Cleaning agents must be same as those used on test area.
   b. If chemical cleaners are to be sprayed on, the pressure shall not exceed 50 psi.

6. Clean exposed CMU masonry by dry brushing after final pointing and at the end of each day’s work to remove mortar spots and droppings in accordance with cleaning methods recommended in NCMA TEK 8-2 applicable to type of stain present.

   a. If additional cleaning is necessary for special or prefaced CMU, consult with masonry unit manufacturer for approved method. Test method and gain Architect approval before proceeding.
   b. Water application method shall never exceed 400 psi without approval of Architect.

7. Concrete unit masonry shall be fully cleaned and approved prior to application of masonry sealer.

3.17 APPLICATION - INTERIOR MASONRY SEALER

A. Before applying sealer, following manufacturers recommendations and precautions for preparation and application of this material. Do not dilute or alter material.

B. Vertical application instruction:

1. Use low-pressure spray, brush, sponge or roller, and apply protective treatment uniformly to the surface. Brush out heavy runs or drips thoroughly for uniform coverage.
2. Use recommended wet-on-wet application. Let the first application penetrate the masonry surface for 2 to 3 minutes. Resaturate the surface.

END OF SECTION 04 22 00

SECTION 04 43 13.16 - ADHERED STONE MASONRY VENEER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Stone masonry adhered to wood framing and sheathing.

B. Related Requirements:

1. Section 072500 “Weather Barriers”
2. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
3. Section 079200 “Joint Sealants”

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Samples for Initial Selection: For colored mortar and other items involving color selection.

C. Samples for Verification:

1. For each stone type indicated. Include at least three Samples in each set and show the full range of color and other visual characteristics in completed Work.
2. For each color of mortar required, Label Samples to indicate types and amounts of pigments used.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, supply sources, and other information as required to identify materials used. Include mix proportions for mortar and source of aggregates.

1. Neither receipt of list nor approval of mockups constitutes approval of deviations from the Contract Documents contained in mockups unless Architect approves such deviations in writing.

C. Material Test Reports:

1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous three years.
2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.

B. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical exterior wall in sizes approximately 48 inches long by 24 inches high by full thickness, including face and backup wythes and accessories.

    a. Include adhered stone coping at top of mockup.
    b. Include a sealant-filled joint at least 16 inches (400 mm) long in mockup.
    c. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit stone masonry above half of flashing).
    d. Include wood studs, sheathing, drip screed, sealant, flashing, and weep holes in exterior masonry-veneer wall mockup.

3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Sealant Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for compatibility and adhesion testing according to sealant manufacturer's standard testing methods and Section 079200 "Joint Sealants," Samples of materials that will contact or affect joint sealants.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.

1.9 FIELD CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining stone masonry face.

1. Protect base of walls from rain-splashed mud and mortar splatter using coverings spread on the ground and over the wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1.10 WARRANTY

A. Special Warranty: Manufacturer’s standard warranty coverage against defects in materials when installed in accordance with manufacturer’s installation instructions.

1.11 COORDINATION

A. Advise installers of other work about specific requirements for placement of flashing and similar items to be built into stone masonry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: MSI – M S International Inc. – COLOR: GOLDEN WHITE - STYLE: NATURAL RANDOM SIZES IN FIELD STACKING - SEE SITE FOR IMAGE: https://www.msistone.com/thin-veneers/golden-white/
   1. MSI Stone – MSI Cleveland – 9501 Allen Drive Valley View, Ohio 44125
   2. Approved Equal

B. Source Limitations for Stone: Obtain stone, from single quarry, with resources to provide materials of consistent quality in appearance and physical properties.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

D. Varieties and Sources: Subject to compliance with requirements, provide stone of varieties and from sources complying with Section 044200 "Exterior Stone Cladding."

2.2 MANUFACTURED UNITS

A. MS International Stone – Golden White – Natural Random Sizes in field stacking

2.3 OTHER MANUFACTURED STONE ACCENTS AND CAPS

A. Color Sample to be provided prior to ordering

B. Accent Bands / Sills
   1. MS International Stone - Precast Band/Sill (color: Taupe) – 23.5” x 3”x 2” (face) x 2” (back).
   2. Approved Equal.

C. Window Sills
   1. MS International Stone - Precast Band/Sill (color: Taupe) – 23.5” x 3”x 2” (face) x 2” (back).
   2. Approved Equal.

D. Column Caps
   1. MS International Stone - Precast Band/Sill (color: Taupe) – 18” x 24” x 2.25”.
   2. Approved Equal.

E. Wall Caps
   1. MS International Stone - Precast Band/Sill (color: Taupe) – 16” x 23.5” x 2”.

2. Approved Equal.

F. Match Architect's samples for color, finish, and other stone characteristics relating to aesthetic effects.

G. Weather Barrier:

1. Bottom Layer: Must meet ICC AC-38, synthetic house wrap.
2. Top Layer: Must meet ASTM D 226, Type 1, No. 15, non-perforated asphalt-saturated felt paper.

H. Reinforcing: ASTM C 847, 3.4lb (1.8 kg/m^2) galvanized 3/8" rib lath complying with code agency requirements for the type of substrate over which stone veneer is installed

I. Fasteners/Attachment Devices: Corrosion resistant, self- tapping screws with a 7/16" head that penetrate the sheathing beyond.

J. Mortar:

1. Masonry Cement: ASTM C270, Type N or S
2. Aggregate: Manufactured or natural sand, ASTM C897
3. Water: Potable
4. Pre-packaged Latex-Portland Cement Mortar: ANSI A118.4

2.4 MORTAR MIXES

A. Jointless/Dry-Stacked Installation:

1. Polymer modified mortar complying with ANSI A118.4
2. Mortar prepared to comply with ASTM C270. Type S mortar.

2.5 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, and as follows:

1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy as follows:

a. Basis of Design: Amico Building Products: Foundation Weep Screed AMFWS-425-750 (Dark Bronze)

b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

B. Application: Unless otherwise indicated, use the following:

1. Where flashing is partly exposed and is indicated to terminate at wall face, elastomeric thermoplastic flashing with drip edge

C. Solder and Sealants for Sheet Flashings

1. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Adhesives, Primers, and Seam Tapes for Flexible Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.3 INSTALLATION OF ADHERED STONE MASONRY VENEER

A. Install flashing over sheathing and behind weather-resistant sheathing paper by fastening through sheathing into framing.

B. Install lath over weather-resistant sheathing paper by fastening through sheathing into framing to comply with ASTM C 1063.

C. Install lath over unit masonry and concrete to comply with ASTM C 1063.

D. Install scratch coat over metal lath 3/8 inch (10 mm) thick to comply with ASTM C 926.

E. Coat backs of stone units and face of scratch coat with cement-paste bond coat, then butter both surfaces with setting mortar. Use sufficient setting mortar so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and scratch coat.

3.4 ADJUSTING AND CLEANING

A. Remove and replace stone masonry of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
2. Defective joints.

3. Stone masonry not matching approved samples and mockups.
4. Stone masonry not complying with other requirements indicated.

B. Replace in a manner that results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.
6. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.5 EXCESS MATERIALS AND WASTE

A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.

B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches (100 mm) in greatest dimension.
2. Mix masonry waste with at least 2 parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other waste, and legally dispose of off Owner's property.

END OF SECTION 04 43 13.16

SECTION 04 72 00 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. General Contractor to provide:

1. All work associated with cast stone trim.

B. Section Includes:

1. Cast stone trim, banding and copings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and finishes.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

C. Samples:

1. For each color and texture of cast stone required.
2. For colored mortar.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute, the Architectural Precast Association, or the Precast/Prestressed Concrete Institute for Group A, Category AT.

PART 2 - PRODUCTS

2.1 CAST STONE UNITS

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. The Cast Stone Institute and the Architectural Precast Association have lists of manufacturers on their Web sites.

B. Provide cast stone units complying with ASTM C 1364 using either the vibrant dry tamp or wet-cast method.

1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
2. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
3. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
4. Provide drips on projecting elements unless otherwise indicated.

C. Cure units as follows:

1. Cure units in enclosed moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:

a. No fewer than five days at mean daily temperature of 70 deg F (21 deg C) or above.
b. No fewer than six days at mean daily temperature of 60 deg F (16 deg C) or above.
c. No fewer than seven days at mean daily temperature of 50 deg F (10 deg C) or above.
d. No fewer than eight days at mean daily temperature of 45 deg F (7 deg C) or above.

D. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

E. Colors and Textures: As selected by Architect from manufacturer’s full range.

2.2 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666 or steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M.

B. Dowels: 1/2-inch- (12-mm-) diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666 or steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123/A 123M.

C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner complying with requirements in Section 042000 "Unit Masonry," and expressly approved for intended use by cast stone manufacturer and cleaner manufacturer.

2.3 MORTAR

A. Comply with requirements in Section 042000 "Unit Masonry" for mortar materials and mixes.

1. For setting mortar, use Type S.
2. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

2.4 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to sample and test cast stone units according to ASTM C 1364.

1. Include one test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 SETTING CAST STONE IN MORTAR

A. Install cast stone units to comply with requirements in Section 042113 "Brick Masonry."

B. Set units in full bed of mortar with full head joints unless otherwise indicated.

1. Fill dowel holes and anchor slots with mortar.
2. Fill collar joints solid as units are set.
3. Build concealed flashing into mortar joints as units are set.
4. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.
5. Keep joints at shelf angles open to receive sealant.

C. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

D. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

F. Provide sealant joints at copings and other horizontal surfaces, at expansion, control, and pressure-relieving joints, and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.2 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

A. Set units accurately in locations indicated with edges and faces aligned.

1. Install anchors, supports, fasteners, and other attachments to secure units in place.
2. Shim and adjust anchors, supports, and accessories.

B. Fill anchor holes with sealant.

1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.

C. Set cast stone supported on clip or continuous angles on resilient setting shims. Hold shims back from face of cast stone a distance at least equal to width of joint.

D. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored.

E. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch (1.5 mm), except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone to comply with requirements in Section 042113 "Brick Masonry."

END OF SECTION 04 72 00

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Shear wall panels.
4. Wood blocking and nailers.
5. Wood furring.
6. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Engineered wood products.
3. Shear panels.
4. Power-driven fasteners.
5. Post-installed anchors.
6. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction, Stud, or No. 3 grade.

1. Application: Interior partitions not indicated as load bearing.
2. Species:

a. Southern pine or mixed southern pine; SPIB.
b. Northern species; NLGA.
c. Eastern softwoods; NeLMA.
d. Western woods; WCLIB or WWPA.

B. Framing Other Than Non-Load-Bearing Partitions: Construction or No. 2 grade.

1. Application: Framing other than interior partitions not indicated as load bearing.
2. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Southern pine or mixed southern pine; SPIB.
e. Spruce-pine-fir; NLGA.
f. Douglas fir-south; WWPA.
g. Hem-fir; WCLIB or WWPA.
h. Douglas fir-larch (north); NLGA.
i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Framing Other Than Non-Load-Bearing Partitions: Any species and grade with a modulus of elasticity of at least 1,000,000 psi (6900 MPa) for 2-inch nominal (38-mm actual) thickness and 12-inch nominal (286-mm actual) width for single-member use.

1. Application: Framing other than interior partitions not indicated as load-bearing.

D. Exposed Framing: Hand-select material for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Species and Grade: As indicated above for load-bearing construction of same type.

2.4 ENGINEERED WOOD PRODUCTS

A. Engineered Wood Products, General: Products shall contain no urea formaldehyde. Remaining paragraphs below are examples of descriptive and property requirements based on Product Data of various manufacturers. Verify that current products comply or revise to suit Project. See the Evaluations.

B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi (20.0 MPa) for 12-inch nominal-(286-mm actual-) depth members.
2. Modulus of Elasticity, Edgewise: 1,800,000 psi (12 400 MPa)

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.

6. Grounds.

B. Dimension Lumber Items: Standard, Stud, or No. 3 grade lumber of any species.

C. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine or southern pine; No. 3 grade; SPIB.
2. Eastern softwoods; No. 3 Common grade; NeLMA.
3. Northern species; No. 3 Common grade; NLGA.
4. Western woods; Standard or No. 3 Common grade; WCLIB or WWPA.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

1. Plywood shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 as appropriate for the substrate.

2.8 METAL FRAMING ANCHORS

A. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.
2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Install shear wall panels to comply with manufacturer's written instructions.

E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Do not splice structural members between supports unless otherwise indicated.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 17 60 - METAL PLATE CONNECTED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood roof trusses.
2. Wood girder trusses.
3. Wood truss bracing.
4. Metal truss accessories.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1.

1.3 RELATED SECTION

A. Section 06 18 50 – Structural Glue – Laminated Timber

1.4 SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Show fabrication and installation details for trusses.

1. NOTE: TIMBER TRUSSES ARE LONG LEAD TIME ITEMS WHICH REQUIRE EARLY PURCHASE. SUBMIT SHOP DRAWINGS WITHIN SIX WEEKS OF NOTICE TO PROCEED.
2. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
3. Indicate sizes, stress grades, and species of lumber.
4. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.
7. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For metal-plate manufacturer, professional engineer, fabricator and Installer.

D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Metal-plate connectors.

2. Metal truss accessories.

1.5 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

E. A registered engineer shall prepare design for trusses and the glue laminated components of the roof system. Certified drawings shall be submitted for permit.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

A. Lumber: DOC PS 20. Provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Grade and Species: For truss chord and web members, provide dimension lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

C. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 6 Section "Rough Carpentry."

2.2 METAL PRODUCTS

A. Connector Plates: Fabricate connector plates to comply with TPI 1 from hot-dip galvanized steel sheet complying with ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

1. Provide powder-coat finger-style steel brackets for HT trusses.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Alpine Engineered Products, Inc.
b. Cherokee Metal Products, Inc.; Masengill Machinery Company.
c. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.

B. Fasteners: Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

1. Nails, Brads, and Staples: ASTM F 1667.
2. Power-Driven Fasteners: NES NER-272.
3. Wood Screws: ASME B18.6.1.
4. Lag Bolts: ASME B18.2.1.
5. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

C. Metal Truss Accessories: Provide truss accessories made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:

a. Harlen Metal Products, Inc.
b. Simpson Strong-Tie Co., Inc.
c. Southeastern Metals Manufacturing Co., Inc.

2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.3 FABRICATION

A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.

F. Securely connect each truss ply required for forming built-up girder trusses.

G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Division 6 Section "Rough Carpentry."

H. Install wood trusses within installation tolerances in TPI 1.

I. Do not cut or remove truss members.

J. Replace wood trusses that are damaged or do not meet requirements.

END OF SECTION 06 17 60

SECTION 06 20 00 - FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior Finish Carpentry:
      a. Decking.
      b. T & G plank soffit – Species and dimensional information to be provided by owner.
      c. All exposed wood to receive Stained Structural Wood Systems Color #215-M.

1.2 REFERENCE STANDARDS

A. American National Standards Institute:
   1. ANSI A135.4 - Basic Hardboard.
   2. ANSI A156.9 - Cabinet Hardware.
   3. ANSI A208.1 - Mat-Formed Wood Particleboard.

B. APA-The Engineered Wood Association:
   1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

C. ASTM International:
   1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   2. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
   3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   4. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

D. Architectural Woodwork Institute:
   1. AWI AWS - Architectural Woodwork Standards.

E. Hardwood Plywood and Veneer Association:
   1. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

1.3 SEQUENCING

A. Sequence work to ensure utility connections are achieved in orderly and expeditious manner.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with AWI AWS Section 6 and Section 7 Economy Grade

B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Perform Work in accordance with local and State standards.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years [documented] experience.

B. Fabricator: Company specializing in fabricating products specified in this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

B. Maintain storage space relative humidity within ranges indicated in AWI AWS Section 2.

1.7 ENVIRONMENTAL REQUIREMENTS

A. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.
   1. Maintain relative humidity within ranges indicated in AWI AWS Section 2.

1.8 EXISTING CONDITIONS

A. Verify field measurements prior to fabrication. Indicate field measurements on shop drawings.

PART 2 PRODUCTS

2.1 EXTERIOR MATERIALS

A. Exterior Softwood Lumber: DOC PS 20;.
   1. Cut: Plain sawn
   2. Finger Jointing: Permitted with waterproof adhesives

B. Exterior Preservative Treated Softwood Lumber: DOC PS 20;
   1. Cut: Plain sawn
   2. Finger Jointing: Permitted with waterproof adhesives.

C. Lumber Moisture Content Range: 9-15 percent.

D. Exterior Plastic Boards and Panels: Expanded PVC trim, color to be selected by architect; sizes as indicated on Drawings.
   1. Manufacturer List:
      a. AZEK Building Products; basis of design
      b. CertainTeed Corp.

E. T & G plank soffit & 3/8” bent beaded plywood sheathing to receive Stain: cedar bark sw 3511 semi-transparent stain. apply multiple coats until all stains match. to include all exposed exterior woods & int. window trim. Species and dimensional information to be provided by owner.
      a. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

   SOLID-SAWN WOOD ROOF DECKING

      b. Standard for Solid-Sawn Wood Roof Decking: Comply with AITC 112.

. Roof Decking Species: Balsam fir, Douglas fir-larch, Douglas fir-larch (North), hem-fir, hem-fir (North), southern pine, spruce pine-fir (North), western hemlock, or western hemlock (North).
a. Roof Decking Nominal Size: 2” thick x 6” wide min. 5/4” thickness.
b. Roof Decking Grade: Select(ed) Decking
c. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that are not exposed to view.
d. Moisture Content: Provide wood roof decking with 15 percent maximum moisture content at time of dressing.
e. Face Surface: Smooth.
f. Edge Pattern: Square Edge.

2.2 WOOD TREATMENT

A. Fire Retardant Treatment: Chemically treated and pressure impregnated, having flame spread of 25 or less when tested in accordance with ASTM E 84 and showing no evidence of significant progressive combustion when test is continued for an additional 20 minute period, Exterior Type.

B. Wood Preservative Pressure Treatment: WDMA I.S.4

C. Provide identification on fire retardant treated material.

D. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

E. Moisture Content after Treatment: Redried
1. Lumber: As specified for exterior and interior lumber.
2. Plywood: Maximum 15 percent.

2.3 FABRICATION

A. Fabricate finish carpentry to AWI AWS Section 6 Economy Grade.

B. Shop assemble work for delivery to site, permitting passage through building openings.

C. Fit exposed plywood edges with matching veneer edging. Use one piece for full length only.

D. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.

E. Apply high pressure decorative laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
1. Apply laminate backing sheet to reverse face of high pressure decorative laminate finished surfaces.
2. Cap exposed edges with same HDPL material

2.4 FINISHES

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler matching surrounding surfaces and of types recommended for applied finishes.

D. Stain, seal, and varnish exposed to view surfaces. All exterior exposed wood in entire building as well as int. trim to receive Stain: cedar bark sw 3511 semi-transparent stain. apply multiple coats until all stains match.

E. Seal internal surfaces and semi-concealed surfaces.

F. Prime, paint, Seal surfaces in contact with cementitious materials.

G. Species and dimensional information to be provided by owner.

H. All exposed wood to receive Stained cedar bark sw 3511 semi-transparent stain.

2.5 ACCESSORIES

A. Adhesive for High Pressure Decorative Laminates and T & G plank soffits: Type recommended by laminate manufacturer to suit application.
   a. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with applicable requirements in Section 079200 "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.
      1) Sealants shall have a VOC content of 250 g/L or less.
      2) Sealants shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Wall Adhesive: Cartridge type, compatible with wall substrate, capable of achieving durable bond.

C. Fasteners and Anchors:
   1. Fasteners: ASTM A153/A153M, hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
   2. Nails and Staples: ASTM F1667.

D. Concealed Joint Fasteners: Threaded steel.

E. Lumber for Shimming and Blocking

F. Veneer Edge Band: AWI AWS; standard wood veneer edge band matching face veneer.

G. Plastic Edge Trim: AWI AWS; PVC; color as selected.

H. Wood Filler: Solvent base, tinted to match surface finish color.

I. Hardware: BHMA A156.9 as follows:
   1. Refer to Casework Section 06 41 00 for information on Hardware

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 PREPARATION

A. Prime paint surfaces of wood items and assemblies to be in contact with cementitious materials.

B. Prime paint surfaces of exterior wood items and assemblies.

3.3 DEMOLITION

A. Modify and extend existing finish carpentry installations using materials and methods as specified.

3.4 INSTALLATION

A. Install work in accordance with AWI AWS Section 6 and Section 7 Economy Grade and manufacturer's instructions

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Preparation For Site Finishing:
   1. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

E. Installation Requirements:
   a. Install solid-sawn wood roof decking to comply with AITC 112.
      1) Locate end joints for combination simple and two-span continuous lay-up.
   b. Anchor wood roof decking, where supported on walls, with bolts as indicated.
   c. Apply joint sealant to seal roof decking at exterior walls at the following locations:
      1) Between roof decking and supports located at exterior walls.
      2) Between roof decking and exterior walls that butt against underside of roof decking.
      3) Between tongues and grooves of roof decking over exterior walls and supports at exterior walls.
   d. Provide water-resistive barrier over roof decking as the Work progresses to protect roof decking until roofing is applied.

3.5 TOLERANCES

A. Conform to AWI AWS Section 6 requirements for the following:
   1. Smoothness.
   2. Gaps.
   3. Flushness.
   4. Flatness.

B. Conform to AWI AWS Section 7 requirements for the following:
   1. Smoothness.
   2. Gaps.
   3. Flushness.
   4. Flatness.
   5. Alignment.

3.6 ATTACHMENTS

A. Exterior Finish Carpentry:
   1. Enclosing Structural Members: Softwood lumber; "PT" preservative treat.
   2. Brackets, Finials, and Pediments: Prepare for paint finish.
   3. Enclosing Soffit Spaces: As detailed.

END OF SECTION

SECTION 07 21 00 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Perimeter insulation under slabs-on-grade.
2. Perimeter wall insulation (supporting backfill).
3. Concealed building insulation.
4. Loose-fill building insulation.
5. Sound attenuation insulation.

B. Related Sections include the following:

1. Division 6 Section "Miscellaneous Carpentry" for foam-plastic board sheathing over wood framing.

1.2 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.3 PERFORMANCE REQUIREMENTS

A. Plenum Rating: Provide glass or slag-wool-fiber/rock-wool-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.

1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.
2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 175, respectively:

1. Manufacturers and Product:

a. Dow Chemical Company, SM.
b. UC Industries, Formular 250.

2. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.

2.3 GLASS-FIBER BLANKET INSULATION

A. Manufacturers:

1. CertainTeed Corporation.
2. Johns Manville.
3. Knauf Fiber Glass.
4. Owens Corning.

B. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.

C. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated, or as otherwise indicated on the construction documents:

1. 5-1/2 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.
2. 13 inches thick with a thermal resistance of 30 deg F x h x sq. ft./Btu at 75 deg F

2.4 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER BLANKET INSULATION

A. Manufacturers:

1. Owens Corning.

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.

D. Where slag-wool-fiber/rock-wool-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt form with thermal resistances indicated or as otherwise indicated on construction docuemnts:

1. 5-1/4 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.

2.5 LOOSE-FILL INSULATION

A. Cellulosic-Fiber Loose-Fill Insulation: ASTM C 739, chemically treated for flame-resistance, processing, and handling characteristics.

B. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I for pneumatic application; with maximum flame-spread and smoke-developed indexes of 5.

2.6 AUXILIARY INSULATING MATERIALS

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

1. DOW CORNING non-solvent based PL-300 Adhesive for attachment of boards to masonry back-up.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER and UNDER-SLAB INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.

D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

5. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:

a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

E. Place loose-fill insulation into spaces indicated, by machine blowing, to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

F. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.6 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Install 3-inch thick, unfaced glassslag-wool-fiber/rock-wool-fiber blanket insulation over suspended ceilings at partitions in a width that extends insulation 48 inches on either side of partition.

B. Install 1-1/2-inch thick, unfaced glassslag-wool-fiber/rock-wool-fiber blanket insulation over suspended ceilings so that insulation extends over entire ceiling.

3.7 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Asphalt shingles.
2. Underlayment.
3. Ridge vents.
4. Metal flashing and trim.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Pattison & Sycamore Park

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Evaluation reports.

C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.

1. Material Warranty Period: 50 years from date of Substantial Completion, prorated, with first 10 years nonprorated.
2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 110 mph, 130 max. 15 years from date of Substantial Completion.
3. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 20 years from date of Substantial Completion.
4. Workmanship Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E108 or UL 790 by Underwriters Laboratories, Inc. or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.

1. Basis of Design – Certainteed landmark series color: Pewter
   a. Other Mfr. To be approved by arch./owner : Manta, Owens Corning
   Conforming to ASTM D 3018 Type I – Self-Sealing, UL Certification of ASTM D 3462, ASTM D 3161/UL997 110-mph Wind Resistance and UL Class A Fire Resistance, glass fiber mat base, ceramically colored/UV resistant mineral surface granules across entire face of shingle; algae-resistance; two piece laminate shingle.
   Weight: 229 / 240 pounds per square (dependent on manufacturing location)

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles. Trim each side of lapped portion of unit to taper approximately 1 inch (25 mm).
   1. Or approved equal

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D226/D226M, asphalt-saturated organic felts, nonperforated. – 15lb. felt paper
   A. Type: 36” up from Eaves single membrane frost guard: Eaves Protection: CertainTeed “WinterGuard”; ASTM D1970 sheet barrier of self-adhering rubberized asphalt membrane shingle underlayment having internal reinforcement and “split” back plastic release film; provide material warranty equal in duration to that of shingles being applied. – Or approved equal

2.4 RIDGE VENTS

A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent for use under ridge shingles.
CertainTeed Ridge Vent (4 lf) Filtered, 12 in. width. : Or approved equal

1 Shingle over ridge vent designed with an external baffle to deflect wind and weather over the vent. The external baffle creates low pressure over the vent openings to “pull” air from the attic.
2 Internal weather filter helps protect the attic from wind driven rain, snow, dust and insects.
3 12” vent provides 18 sq inches of net free area per linear foot; 9” vent provides 16 sq inches of net free area per linear foot.
4 CertainTeed Ridge Vent is pre-formed to a 4/12 pitch, and fits pitches from 3/12 to 16/12.
5 Limited Lifetime Warranty and 5-Year SureStartTM Protection.

1. ACCESSORIES

B. Asphalt Roofing Cement: ASTM D4586, Type II, asbestos free.

C. Roofing Nails: ASTM F1667 Standard round wire type roofing nails, corrosion resistant; hot dipped zinc coated steel, aluminum or chromated steel; minimum 3.8 inch (9.5mm) head diameter; minimum 11 or 12 gage (2.5mm) shank diameter; shank to be sufficient length to penetrate through the roof sheathing or $^{3}/_{4}$ inch (19mm) into solid wood, plywood or non-veneer wood decking plywood sheathing.

1. Shank: Smooth.
2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

D. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

E. Synthetic-Underlayment Fasteners: As recommended in writing by synthetic-underlayment manufacturer for application indicated.

2.5 METAL FLASHING AND TRIM

A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
A. Sheet Metal: Sheet Flashing: ASTM B 370; cold rolled copper; 16 ounces per square foot (0.55mm), natural finish.

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt-underlayment nails.

1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches (75 mm) in direction that sheds water. Lap ends of felt not less than 6 inches (150 mm) over self-adhering sheet underlayment.
2. Install fasteners at no more than 36 inches (914 mm) o.c.

C. Self-Adhering Sheet Underlayment 36” up from Eaves: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.

A. Prime plywood to receive self-adhering sheet underlayment. Place eave edge and gable metal edge flashing tight with fascia boards. Weather-lap joints 2 inches (50mm). Secure flange with nails spaced 8 inches (200 mm) on center.

B. Apply CertainTeed “WinterGuard” Waterproofing Shingle Underlayment as eave protection in accordance with manufacturer’s instructions.

3.2 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

A. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems.” Weather-lap joints minimum 2 inches (50 mm).

B. Seal work projecting through or mounted on roof with asphalt roofing cement and make weather tight.

ASPHALT-SHINGLE INSTALLATION

B. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

C. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip at least 7 inches (175 mm) wide with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 3/4 inch (19 mm) over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

E. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with 6-inch (150-mm) manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

F. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.

G. Fasten asphalt-shingle strips with a minimum of fourroofing nails located according to manufacturer's written instructions.
1. When ambient temperature during installation is below 50 deg F (10 deg C) seal asphalt shingles with asphalt roofing cement spots.

H. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

I. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.3 SNOW GUARDS: Basis of Design: Rocky Mountain Snow Guards Inc. : ST9 Snow Guard – Color/Material: - Copper

A. Or Arch./Owner approved Equal

PART 1 – GENERAL

1.1 SUMMARY

A. WORK INCLUDES

1. ST9 snow guard attaches directly to the roof deck.
2. Coordinate with the installation of the roof to assure proper placement of the snow guards.
3. Provide appropriate snow guard and fasteners for the roof system

B. RELATED SECTIONS

1.	Section 07600:	Flashings and Sheet Metal
2.	Section 07310:	Shingles
3.	Section 07320:	Roofing Tiles
4.	Division 7:	Thermal and Moisture Protection

1.2 SYSTEM DESCRIPTION

A. COMPONENTS

1. ST9 snow guard system consists of individual metal snow guards
2. Fasteners
   a. To be of metal compatible with snow guards
   b. Fasteners should be selected for compatibility with roof deck
   c. All snow guards must be mechanically fastened to the roof deck.
3. Sealant
   a. To be approved by the roofing material manufacturer

B. DESIGN REQUIREMENTS

1. Spacing to be recommended by manufacturer or building engineer.
2. Minimum 2 fasteners per snow guard.
3. It is important to design new structures or assess existing structures to make sure that they can withstand retained snow loads.

1.3 SUBMITTAL

A. Submit manufacturer's specifications, standard detail drawings, recommended layout and installation instructions.

1.4 QUALITY ASSURANCE

A. Installer to be experienced in the installation of specified roofing material and snow guards for not less than 5 years in the area of the project.

1.5 DELIVERY / STORAGE / HANDLING

A. Inspect material upon delivery and order replacements for any missing or defective items. Keep material dry, covered and off the ground until installed.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Rocky Mountain Snow Guards, Inc. 2055 S. Raritan St. Unit B Denver, CO 80223

2.2 MATERIALS

A. Copper – all snow guard components are 16 oz. copper.
B. Aluminum – All snow guard components are .032 Aluminum

2.3 FINISH

A. Mill Finish
B. Kynar 500 pre finished sheet – Aluminum only.
C. Powder Coated, exterior grade powder only.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Substrate

1. Inspect structure to verify that roofing structure will withstand additional retained snow loads. Notify owner or general contractor of any deficiencies before installing snow guards.

2. Verify that roofing material has been installed properly prior to installing snow guards.

3.2 INSTALLATION

A. Comply with architectural drawings for location and with Manufacturer's instructions for installation and layout.

Snow Guards

2055 S. Raritan St Unit B, Denver, CO 80223, www.rockymountainsnowguards.com, 877.414.7606.

END OF SECTION 073113

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SECTION 07 42 13.53 - METAL SOFFIT PANELS

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. Preformed, prefinished soffit panels.
2. Fasteners.
3. Underlayment.

B. Related sections

1. Section 06100 - Rough Carpentry
2. Section 07620 - Sheet Metal Flashing and Trim
3. Section 07920 - Joint Sealants

1.3 REFERENCES

A. Aluminum Association (AA)

1. AA-C22-A41: Clear Coatings
2. AA-C22-A42: Integral Color Coatings
3. AA-C22-A44: Color In Process

B. American Society for Testing and Materials (ASTM)

1. ASTM B137: Test Method for Measurement of Coating Mass Per Unit Area of Anodically Coated Aluminum
2. ASTM B209: Specification for Aluminum and Aluminum-Alloy Sheet and Plate

1.4 SUBMITTALS

A. Submit the following:

1. Product Data: Manufacturer’s product literature for the roofing specified.
2. Shop Drawings: Indicate thickness and dimension of parts, flashing and anchoring methods, and detail and location of joints; including joints necessary to accommodate thermal movement.
3. Samples:

a. 2 samples of each type of panel assembly, 12 inch by 12 inch minimum.

b. 6 samples of each finish in color or colors selected, 3 inch by 5 inch minimum.

5. Affidavit certifying that the material meets the requirements specified.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum of 5 years experience in manufacturing metal panels similar to those specified.

B. Installer Qualifications: Acceptable to panel manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in manufacturer's original crating, properly labeled for identification and installation purposes. Store materials in accordance with panel manufacturer's recommendations. Handle materials carefully to avoid damage to panels and finishes.

1.7 WARRANTY

A. The Contractor shall warrant the materials to be free of faults and defects in accordance with the General Conditions, except that the warranty shall be extended by paint manufacturer's standard multi-year warranty. The warranty shall be in writing and shall be signed by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Product: Firestone UC-750 V-Groove Panels, 12" width or equal by approved manufacturers:

1. Metal Sales.
2. ATAS.
3. DMI Metals

2.2 PANEL TYPE

A. UNA-CLAD UC-750 Soffit Seam Panels, roll formed aluminum soffit

panels. 2.3 PANEL MATERIALS AND FABRICATION

A. Aluminum Panels: ASTM B209, Aluminum Association specification sheet 3003-H14/3105-H14 for painted finish.

1. Thickness: 0.032 inch.

B. Form panels in longest practical lengths, true to shape, accurate in size, square, and free from distribution or manufacturing defects.

1. Panel Depth: 1/2 inch.
2. Panel Width: 12 inch.

C. Fabricate panels with an interlocking leg (male/female interlocking joint design).

2.4 ACCESSORIES

A. Fasteners: Concealed, non-corrosive, 5/8 inch self-tapping sheet metal screws for securing to metal substrate.

2.5 FINISHES

A. Coil-Coated or Spray-Applied Fluorocarbon Resin

1. Color: Selected by Architect/Engineer from manufacturer's standard colors.
2. Number of Coats: 2-coat.
3. Provide factory applied strippable plastic film for protection during fabrication and installation.
4. Color to match DMI metals standard DARK BRONZE

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which materials are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

B. Surfaces to receive panels shall be even, smooth, sound, clean, dry, free of ice and snow, and free from defects.

3.2 PREPARATION

A. Obtain field measurements prior to completion of manufacturing and finishing. When field measurements are not possible, provide method of installation that will allow minor adjustment in the field.

3.3 INSTALLATION

A. Install panel system plumb, level and true, in accordance with manufacturer's instructions, final shop drawings, and SMACNA Architectural Sheet Metal manual and standard practices.

B. Completed system shall be free from overbending, deforming, stretching, distortion, waves, and buckles.

3.4 ADJUSTING AND CLEANING

A. Repair panels with minor damage.

B. Remove panels damaged beyond repair and replace with new panels to match adjacent undamaged panels.

C. Clean exposed panel surfaces promptly after installation in accordance with recommendations of panel and coating manufacturers.

D. Remove protective film immediately after installation.

END OF SECTION 07 41 00

SECTION 07 46 46 - FIBER-CEMENT SIDING

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 fiber-cement siding, trim, and soffits.

B. Work is included in base bid.

C. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
0. Section 072500 "Weather Barriers" for weather-resistive barriers.

1.3 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Initial Selection: For fiber-cement siding, trim, and soffit including related accessories.

C. Samples for Verification:

1. 12-inch- (300-mm) long-by-actual-width Sample of siding.
a. Lap Siding
b. Shingle Siding

2. 12-inch- (300-mm) long-by-actual width Sample of accent trim boards.
3. 12-inch- (300-mm) long-by-actual width Sample of soffit panels.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement siding.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.

C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish full lengths of fiber-cement siding including related accessories, in a quantity equal to 2 percent of amount installed.

1.9 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for fiber-cement siding, trim boards, and soffit panels including accessories.

   a. Size: 48 inches (1200 mm) long by 60 inches (1800 mm) high.
   b. Include outside corner on one end of mockup and inside corner on other end.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including cracking and deforming.
b. Deterioration of materials beyond normal weathering.

2. Warranty Period: 10 years from date of Substantial

Completion. PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING – Shake Style

A. Basis of Design Product: James Hardie Building Products; Staggered Edge Panel, 7” exposure or equal by approved manufacturers:

1. Certain Teed Corporation
2. Nichiha Fiber Cement

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than 1/4 inch (6 mm).

D. Horizontal Pattern: Boards 48” in length (1219 mm) wide in plain style.

1. Texture: Cedar Shake

E. Color: MFR. Standard: LIGHT MIST

2.3 FIBER CEMENT TRIM BOARDS & FASCIA’S

A. Basis of Design Product: James Hardie Building Products; 5/4 NT3 Smooth, 2”,4”,8”,10” width or equal by approved manufacturers:

1. Certain Teed Corporation
2. Nichiha Fiber Cement

B. Labeling: Provide fiber-cement trim boards that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

1. Nominal Thickness: Not less than 1 inch (25 mm).

C. Pattern: Trim boards 2”,4”,8”,10” wide in plain style.

1. Texture: Smooth.

D. Color: All exterior trim to be mfr. Standard – RICH ESPRESSO

2.4 FIBER CEMENT SOFFIT PANELS

A. Basis of Design Product: James Hardie Building Products; Beaded porch panel, 48” width or equal by approved manufacturers:

1. Certain Teed Corporation
2. Nichiha Fiber Cement

B. Labeling: Provide fiber-cement trim boards that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than 1/4 inch (6 mm).

1. Pattern: Boards 96” in length (2438 mm) wide in plain style.
2. Texture: Smooth.

D. Color: mfr. Standard – RICH ESPRESSO

2.5 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

B. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

C. Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

1. Finish for Aluminum Flashing: Factory-prime coating.

D. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.

2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch (6 mm), or three screw-threads, into substrate.
3. For fastening fiber cement, use hot-dip galvanized fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Install fasteners no more than 24 inches (600 mm) o.c.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weather tight installation.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07 46 46

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes flashings, counterflashings, and formed sills.

1. Provide reglets and accessories.

B. Related Sections:

1. Section 04 22 00 - Concrete Unit Masonry: Through-wall flashings in masonry.
2. Section 06 10 00 - Miscellaneous Rough Carpentry: Wood blocking for metal roofing substrate profiles.
3. Section 07 41 13 - Metal Roofing
4. Section 07 71 23 - Manufactured Gutters and Downspouts.
5. Section 07 90 00 - Joint Protection.
6. Section 09 90 00 - Painting and Coating: Field painting.

1.2 REFERENCES

A. American Architectural Manufacturers Association:

1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2604 - Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. ASTM International:

1. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM B101 - Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction.
4. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. Copper Development Association Inc.:

1. CDA - Copper in Architecture - Handbook.

D. Federal Specification Unit:

1. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.

E. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - Architectural Sheet Metal Manual.

1.3 DESIGN REQUIREMENTS

A. Sheet Metal Flashings: Conform to the following criteria of SMACNA "Architectural Sheet Metal Manual."

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Product Data: Submit data on manufactured components metal types, finishes, and characteristics.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with O.B.C. and all applicable codes and standards.

1.6 QUALIFICATIONS

A. Installer: Company specializing in sheet metal work with minimum three years' experience.

1.7 PRE-INSTALLATION MEETINGS

A. Section 01 31 13 - Administrative Requirements: Pre-installation meeting.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials causing discoloration or staining.

1.9 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate with Work of Section 04 22 00 for installing recessed flashing reglets.

PART 2 - PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM

A. Manufacturers:

1. Cheney Flashing Company - 623 Prospect St. Trenton, NJ 08605 (800) 322-2872
2. Keystone Flashing Company, Inc - 5119 N.2nd St. Philadelphia, PA 19120. (800) 526-8348.
3. Sandell Manufacturing Co., Inc - 310 Wayto Rd. Schenectady, NY 12303 (800) 283-3888
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Pre-Finished Galvanized Steel Sheet: ASTM A755/A755M; structural steel sheet, G90 (Z275) zinc coating; 0.024 inch thick core steel, shop pre-coated with two coat fluoropolymer top coat; color as selected from manufacturer's standard color.

C. Pre-Finished Aluminum Sheet: ASTM B209; 3003 alloy, H14 alloy and temper as required for application and finish; 0.040 inch (1.02 mm) thick; mill finish shop pre-coated with two coat fluoropolymer top coat; color as selected from manufacturer's standard color.

D. Lead Coated Copper: ASTM B101; O60 temper, 16 oz/sq ft (5,185 gm/sq m).

E. Stainless Steel Sheet: 304 stainless steel sheet for flashing embedded in masonry and for exposed drip edges.

2.2 ACCESSORIES

A. Fasteners: Galvanized steel, Aluminum or same material and finish as flashing metal, with soft neoprene washers as required.

B. Underlayment: ASTM D226; Type II, No. 30 unperforated asphalt felt.

C. Slip Sheet: Rosin sized building paper.

D. Primer: Zinc molybdate type.

E. Protective Backing Paint: Zinc molybdate alkyd.] [FS TT-C-494, Bituminous.

F. Sealant: Type E butyl sealant specified in Section 07 90 00.

G. Plastic Cement: ASTM D4586, Type I.

H. Reglets: Surface mounted type, galvanized steel; face and ends covered with plastic tape.

2.3 FACTORY FINISHING

A. Fluoropolymer Coating: Multiple coat as specified for sheet metal system, thermally cured, conforming to AAMA 2604.

B. Washcoat: Finish concealed side of metal sheets with washcoat compatible with finish system, as recommended by finish system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets to lines and levels indicated on Drawings. Seal top of reglets with sealant.

C. Paint concealed metal surfaces with protective backing paint to minimum dry film thickness of 15 mil (0.4 mm).

1.1 INSTALLATION

D. See Section 04 20 00 for installation of concealed reglets.

E. Secure flashings in place using concealed fasteners.

F. Apply plastic cement compound between metal flashings and felt flashings.

G. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

H. Seal metal joints watertight.

3.3 FIELD QUALITY CONTROL

A. Inspection will involve surveillance of Work during installation to ascertain compliance with specified requirements.

END OF SECTION 07 62 00

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. General Contractor to provide:

1. Joint sealants wherever sealants are required in the construction documents not related to other Prime Contractors work.

B. Plumbing Contractor to provide:

1. Joint sealants at all plumbing work requires sealant/caulk around plumbing fixtures.

C. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed joint sealants.
5. Acoustical joint sealants.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers eight samples of materials that will contact or affect joint sealants. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Preconstruction compatibility and adhesion test reports.

C. Preconstruction field-adhesion test reports.

D. Field-adhesion test reports.

E. Warranties.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial

Completion. PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFATCURERS

A. Products: Subject to compliance with requirements, provide one of the following products for each type sealant scheduled at end of Part 3.

1. Urethane Sealant (Type S-1 Sealant):

a. Pecora Corp.; Product - Dynatrol II.
b. Sika Corp.; Product - Sikaflex 2a NS.
c. TREMCO; Product - Dymeric 24002240 FC.
d. SonneoChemRex Inc.; Product - Sonneborn NP 2.

2. Acrylic-Emulsion Sealant (Type S-2 Sealant):

a. Pecora Corp.; Product - AC-20.
b. Sonneborn Building Products Div., ChemRex, Inc.; Product - Sonolac.
c. Tremco, Inc.; Product - Tremco Acrylic Latex 834.

3. Multi-Part, Nonsag Urethane Sealant for Joint Subjected to Traffic (Type S-3):

a. W.R. Meadows.; Product - Dualthane.
b. Pecora Corp.; Product - Dynatred.

c. Tremco, Inc.; Product - HPL.
d. Sika Corp.; Product - Sikaflex la.
e. Sonneborn Building Products Div., ChemRex, Inc.; Product - SL2 Slop Grade

4. One Part Polysulfide Sealant (Type S-4 Sealant)

a. Sonneborn Building Products Div., ChemRex, Inc.; Product - Sonneborn NP 1.
b. Pecora Corp.; Product - Synthacalk GC-9.

5. Silicone Sealant (Type S-5 Sealant):

a. Dow Chemical; Product - 786 Mildew Resistant.
b. General Electric; Product - Sanitary 1700.
c. Sonneborn Building Products Div., ChemRex, Inc.; Product-Omniplus.
d. Pecora Corporation; Product - 898 Silicone Sanitary Sealant.
e. Tremco; Product - Tremsil 200.

2.2 MATERIALS, GENERAL

A. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.3 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

a. Pecora Corporation.
b. USG Corporation.

2.4 JOINT SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application

indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.

G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

   a. Perform 1 test for each side of frame of joint length..

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

A. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces. Provide sealant type, by one of the specified manufacturers, of usage listed.

	Sealant Type	Usage
1.	S-1	Control and expansion joints in unit masonry.
2.	S-1	Joints between different materials listed above.
3.	S-1	Perimeter joints between materials listed above and frames of doors and windows.
4.	S-1	Other joints not specifically indicated.
5.	S-4	Under outer legs of threshold.

B. Exterior joints in the following horizontal traffic surfaces: Provide sealant type, by one of the specified manufacturers, for usage listed.

	Sealant	Usage
1.	S-3	Control, expansion, and isolation joints in cast-in-place concrete slabs.

C. Interiorjoints in the following vertical surfaces and horizontal nontraffic surfaces: Provide sealant by onetype, of the specified manufacturers for usage listed.

	Sealant Type	Usage
1.	S-1	Control and expansion joints on exposed interior surfaces of exterior walls. Seal joints in slab at areas where concrete is to remain exposed. Do not seal joints at areas where slab is to receive a finish floor.
2.	S-1	Perimeter joints of exterior openings where indicated.
3.	S-1	Tile control and expansion of joints.
4.	S-1	Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
5.	S-2	Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
6.	S-5	Joints between plumbing fixtures and adjoining walls, floors, and counters.
7.	S-1	Other joints not specifically indicated.

D. Interior joints in the following horizontal traffic surfaces: Provide sealant type, by one of the specified manufacturers, for usage listed.

	Sealant Type	Usage
1.	S-3	Control and expansion joints in cast-in-place concrete slabs.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

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. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Section 087100:"Door Hardware".
2. Section 099100: “Painting” - "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.

16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Energy Efficient Exterior Openings: Comply with minimum thermal ratings, based on ASTM C1363. Openings to be fabricated and tested as fully operable, thermal insulating door and frame assemblies.

1. Thermal Performance (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM C1363 and meet or exceed the following requirements:

a. Door Assembly Operable U-Factor and R-Value Ratings: U-Factor 0.36, R-Value 2.7, including insulated door, kerf frame and thermal-break threshold.

2. Air Infiltration (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM E283 to meet or exceed the following requirements:

a. Rate of leakage of the door assembly shall not exceed 0.25 cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity).

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CECO Door Products.
2. Curries Company.
3. Steelcraft.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

B. Energy Efficient Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 “Laminated Core.”

a. Provide 22 gauge steel stiffeners at 6 inches on-center internally welded at 5" on- center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
b. Thermal properties to rate at a fully operable minimum U-Factor 0.36 and R-Value 2.7, including insulated door, kerf frame and thermal-break threshold.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, welded and filled, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 1.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior weatherstripped Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide weatherstripped profiles with 1/8" integral kerf formed into the frame soffit able to receive manufacturer's listed gasket material.

Available for use in both masonry and drywall construction, with fire rating up to 3 hours complying with NFPA 105, UL 1784, and ASTM E-283 Test criteria.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
3. Frames for Level 3 Steel Doors (up to 48 inches in width): Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
4. Frames for Level 3 Steel Doors (48 inches and up in width): Minimum 12 gauge (0.081-inch -2.7-mm) thick steel sheet.
5. Frames for Level 2 Steel Doors: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
3. Frames for Steel Doors: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
4. Frames for openings up to 48 inches in width: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
5. Frames for openings 48 inches and wider in width: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
6. Frames for Wood Doors: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
7. Frames for Borrowed Lights: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently.

Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

E. Glazing: Comply with requirements in Division 08 Section "Glazing" and with the hollow metal door manufacturer's written instructions.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 08 11 13

SECTION 08 36 13 - RESIDENTIAL SECTIONAL DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Residential sectional doors of the following types:
   1. Sectional doors. (Canyon Ridge Collection)

1.2 REFERENCES

A. ASTM International (ASTM):
   1. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets and detail drawings for each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation details and methods.
   4. Operation and maintenance data.
   5. Nameplate data and ratings for motors.

C. Shop Drawings: Include opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Selection Samples: Submit two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of doors specified in this section, with not less than ten years of documented experience.

B. Installer Qualifications: Company specializing in installing the types of products specified in this section, with minimum of two years of documented experience, and approved by the door manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.

B. Store products indoors in manufacturer's or fabricator's original containers and packaging,

with labels clearly identifying product name and manufacturer. Protect from damage.

1.6 PROJECT CONDITIONS

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

1.7 WARRANTY

A. Finish Warranty:
   1. Warranty period: 5 years against cracking, checking and peeling. - All Residential Doors.
   2. Warranty period: 15 years against rust through. - All Value Residential Doors.
   3. Warranty period: 25 years against rust through. - All Value Plus Residential Doors.
   4. Warranty period: Lifetime against rust through. - All Premium Residential Doors.

B. Delamination Warranty: Provide manufacturer's standard warranty against delamination.
   1. Warranty period: 5 years.

C. Hardware and Springs Warranty: Provide manufacturer's standard warranty against defects in materials or workmanship.
   1. Warranty period: 3 years.

D. Warranty for Optional Windows: Provide manufacturer's standard warranty
   1. Warranty period: 10 years against manufacturing defects and excessive discoloration of the optional windows.
   2. Warranty period: 3 years against defects in materials and workmanship of the optional windows.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Clopay Building Products Company, which is located at: 8585 Duke Blvd.; Mason, OH 45040; Toll Free Tel: 800-526-4301; Tel: 513-770-4800; Fax: 888434-3193; Email: request info (arch@clopay.com); Web: www.clopaydoor.com/commercial/home

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 SECTIONAL OVERHEAD DOORS - GENERAL

A. Wind Performance Requirements: As requested, design doors to withstand positive and negative wind loads as calculated in accordance with applicable building code. Doors tested to 1.5 times design wind load, according to ASTME330.
   1. Design Wind Load: MFR. RECOMMENDATION _lb/sf (__ kPa).

B. Counterbalance Type: Torsion spring counterbalance.
   1. Torsion spring counterbalance mechanism sized to weight of the door, with helically wound, coated oil tempered or galvanized 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.

2. Spring Type: Standard Cycle Spring, 10,000 cycle.
3. Spring Type: Provide optional High Cycle Spring, 20,000 cycle.

C. Counterbalance Type: Extension spring counterbalance.

1. Extension spring counterbalance mechanism sized to weight of the door, with a black painted extension spring; cable sheaves of galvanized steel with high strength galvanized aircraft cable with minimum 7 to 1 safety factor. Standard high strength galvanized aircraft cable to contain spring in the event of spring failure; minimum 7 to 1 safety factor.
2. Standard Cycle Spring: 10,000 cycle.

2.3 RESIDENTIAL SECTIONAL DOORS - Canyon Ridge Collection

A. Residential Sectional Doors: Canyon Ridge Collection as manufactured by Clopay Building Products Company.

1. Model: Clopay Model CAN2 Limited Edition Series Doors.
2. Model: Clopay Model CAN2 Ultra-Grain Series Doors.
3. Door Construction:
   a. Sections: Composite cladding and overlays adhered to base door constructed of foamed in place Intellicore polyurethane core construction between exterior and interior steel skins.
   b. Exterior Steel Skins: Formed from flush 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.
   c. Interior 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.
   d. Section Joints: Sections formed to create weather tight tongue-in-groove meeting joint with thermal break.
   e. Reinforcing: Galvanized and primed steel reinforcement located under each hinge location, pre-punched for hinge attachment.
   f. Door Stiles: Galvanized steel end stiles and center stiles, pre-punched for easy hinge attachment.
   g. Handles: Black powder coated, hot-dipped galvanized step plate and lift handle (2 sets on doors over 10 ft wide) to comply with DASMA 116.
4. Maximum Door Size: 20 ft (6.1 m) wide by 10 ft (3.05 m) high.
5. Base Door Thickness: 2 inches (51 mm).
6. Overall Panel Thickness: 3 inches (76.2 mm).
7. Overall Panel Thickness: 2.5 inches (63.5 mm).
8. Steel Skin Thickness: Minimum 27 gauge 0.016 inch (0.40 mm) exterior; minimum 29 gauge 0.012 inch (0.30 mm) interior.
9. End Stiles: Galvanized steel end stiles, engineered for easy hardware attachment through pre-punched holes. Minimum 20 gauge, 0.034 inch (0.86 mm) thick.
10. Bottom Section: Reinforced with continuous 0.040 inch (1.016 mm) aluminum astragal retainer with U-shaped flexible PVC astragal.
11. Thermal Resistance: Calculated in accordance with DASMA TDS-16.
    a. R-Value: 20.4 deg F hr sq ft/Btu.
    b. R-Value: 18.4 deg F hr sq ft/Btu.
12. Windows: None, doors come standard with no windows.
13. Interior Finish: Stucco embossed texture with shallow U ribbed pattern, white

interior color.

14. Exterior Finish to Match mfr. Recommendation of prototype displayed on website: LOW HEAD ROOM TRACK FRONT MOUNTED CLOPAY INSULATED SECTIONAL GARAGE DOOR COMERCIAL MODEL 3720/3721, w/ 2" THICK STEEL JAMB & 27 GA. STEEL w/ INTELLICORE POLYURETHANE INSULATION IN BETWEEN STEEL SKINS. STYLE : CANYON RIDGE LIMITED EDITION, SERIES 3 DESIGN 37, SOLID TOP SERIES 3 ARCH 1. 7'-8"H X 8'W - COLONIAL STRAP HINGES AND STEP PLATE, w/ RING KNOCKER WITH PLATE. CONT. SEALANT ON ALL SIDES INSIDE AND OUT. WOOD VENEER SAMPLES TO PROVIDED AND SELECTED BY ARCH. https://www.clopaydoor.com/canyonridge
15. Exterior Finish: Composite cladding.
    a. Color: Medium Finish.
    b. Color: Dark Finish.
    c. Color: Walnut Finish.
    d. Color: Whitewash Finish.
    e. Color: Primed.
    f. Texture: Clear Cypress woodgrain.
    g. Texture: Pecky Cypress woodgrain.
    h. Texture: Mahogany woodgrain.
16. Exterior Finish: Composite overlays.
    a. Color: Medium Finish.
    b. Color: Dark Finish.
    c. Color: Walnut Finish.
    d. Color: Whitewash Finish.
    e. Color: Primed.
    f. Texture: Clear Cypress woodgrain.
    g. Texture: Mahogany woodgrain.
17. Exterior Finish: Ultra-Grain Base Door Woodgrain embossed texture with flush design in one of the following color options to simulate the look of stained wood:
    a. Color: Ultra-Grain Cypress Medium Finish.
    b. Color: Ultra-Grain Cypress Walnut Finish.
18. Exterior Finish: Composite overlays with Clear Cypress woodgrain texture and square edges.
    a. Color: Medium Finish.
    b. Color: Walnut Finish.
19. Locking: Standard, non-keyed interior slide bolt.
20. Locking: Provide optional decorative keyed snap latch lock.
21. Weatherstripping: Standard, Provide U -shaped bottom seal.
22. Perimeter Seals: _____.
23. Tracks: Vertical tracks minimum 0.060 inch (1.524 mm) galvanized steel tapered and mounted for wedge type closing. Horizontal tracks minimum 0.075 inch (1.905 mm) galvanized steel, reinforced with minimum 0.0897 inch (2.28 mm) galvanized steel angles as required.

    a. Track Type: Provide optional low headroom track.
    b. Track Width: 2 inches (50 mm).
    c. Track Radius: 10 inch (254 mm).

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Inspect and prepare substrates and openings for compliance with anchorage requirements

using the methods recommended by the manufacturer for achieving best result for the substrates and openings under project conditions. Examine wall and overhead areas, including opening framing and blocking, with installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work in this Section.

B. Do not proceed with installation until substrates and opening have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances and conditions that will be detrimental to the installation are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.2 INSTALLATION

A. Install products in accordance with approved shop drawings and the manufacturer's printed instructions. Install in proper relationship with adjacent construction. Test for proper operation and repeat until satisfactory results are obtained.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. General Contractor to provide:

1. All work associated with glazing.

B. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Storefront framing.
4. Glazed entrances.
5. Interior borrowed lites.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 or ICC's 2006 International Building Code by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.
2. Design Snow Loads: As indicated on Drawings.
3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.4 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction adhesion and compatibility test report.

1.6 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Date of Manufacture.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from Date of Manufacture.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

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. Oldcastle.
2. Viracon, Inc.
3. PPG Inc.
4. Guardian Inc.

B. Float Glass:

1. Shall comply with ASTM C1036 Standard Specification for Flat Glass, Type 1, Class 1 (clear) or Class 2 (tinted, heat-absorbing and light reducing) and Quality q3.
2. ASTM C 1048 Heat Treated Flat Glass, Kind HS or FT (remove ASTM Standard C 1048 if annealed glass), Condition A (uncoated), B (spandrel glass, one surface coated), or C (other coated) glass.

a. Heat Treated Flat Glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.
b. Maximum peak to valley rollerwave 0.003" (0.08mm) in the central area and 0.008" (0.20mm) within 10.5" (267mm) of the leading and trailing edge.
c. Maximum bow and warp 1/32" per lineal foot (0.79mm).
d. All tempered architectural safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.

C. Insulating Glass:

D. Basis of Design Product: Subject to compliance with requirements, provide units by Oldcastle or comparable product comprised of:

1. Exterior Lite: Y4" PPG Solarban z75Low-E #2.
2. Interior Lite: Y4" Clear.
3. 1/2" Cavity: 1/2" (air fill).
4. Winter U-Factor: 0.28 minimum.
5. Summer U-Factor: 0.26 minimum.
6. Solar Heat Gain Coefficient: 0.24 minimum.
7. Shading Coefficeint: 0.28 minimum.
8. Unit shall comply with ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.
    a. Units shall be certified for compliance by the IGCC in accordance with the above ASTM test method.
9. The unit overall thickness tolerance shall be -1/16" (1.59mm) / +1/32" (0.79mm). Unit constructed with patterned or laminated glass shall be +/-1/16" (1.59mm).
10. Shall comply with ASTM E 546 Standard Test Method for Frost Point of Sealed Insulating Glass Units
11. Shall comply with ASTM E 576 Standard Test Method for Frost Point of Sealed Insulating Glass Units in the Vertical Position
12. Sealed Insulating Glass Units to be double sealed with a primary seal of polyisobutylene and a secondary seal of silicone.
    a. The minimum thickness of the secondary seal shall be 1/16" (1.59mm).
    b. The target width of the primary seal shall be 5/32" (3.97mm).
    c. There shall be no voids or skips in the primary seal.
    d. Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1/16" (1.59mm) by maximum length of 2" (51mm) with gaps separated by at least 18" (457mm). Continuous contact between the primary seal and the secondary seal is desired.
    e. Both primary and secondary sealant adhesion shall exhibit continuous, tenacious adhesion to both glass and spacer contact areas.
13. To provide a hermetically sealed and dehydrated space, lites shall be separated by an aluminum spacer with three bent corners and one keyed-soldered corner or four bent corners and one straight butyl injected zinc plated steel straight key joint.

E. Laminated Glass:

1. Shall comply with ASTM 1172 Standard Specification for Laminated Architectural Flat Glass.

2. All laminated architectural safety glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.
3. Laminated Glass products to be fabricated free of foreign substances and air or glass pockets in autoclave with heat plus pressure.

F. Coated Vision Glass:

1. Shall comply with ASTM C 1376 Standard for Pyrolytic and Vacuum Deposition Coatings on Glass
2. Coated products to be magnetically sputtered vacuum deposition (MSVD)
3. Edge Deletion – When low-e coatings are used within an insulating unit, coating shall be edge deleted to completely seal the coating within the unit.

    a. The edge deletion should be uniform in appearance (visually straight) and remove 95% of the coating.

2.3 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies.

2.4 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
3. Silicone complying with ASTM C 1115.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
5. Setting blocks 100% silicone.

2.5 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
6. BASIS-OF-DESIGN: Dow Corning 982 silicone as the secondary sealant can be used in insulating units. Dow Corning 795, 799, 983, 995 and 1199 structural silicones and Dow Corning 756, 790, 791 non-structural glazing silicone sealants for weather seals as these materials are compatible with Dow Corning 982.
7. The compatibility of other sealants with Dow Corning 982 must be approved by their respective manufacturers. Acetic acid liberating silicone sealants (acetoxy sealants) must not be used.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

D. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

E. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 GLAZING SCHEDULE

A. All products shall comply with ASTM Standards and requirements in Article 2.3 Materials.

B. Clear Glass IG (GT-2):

1. Products: Provide one of the following:

   a. PPG Industries.
   b. Libby Owens Ford.
   c. AGC.

C. Reflective and low-E Insulating-Glass IG (GT-3):

1. Products: Provide one of the following:

   a. PPG Industries.
   b. Libby Owens Ford.
   c. AGC.

2. Overall Unit Thickness and Thickness of Each Lite: 1” and 1/4”.
3. Interspace Content: Air.
4. Lite: Gray-Blue (match adjacent Mount Olive Public Library and Architect’s Sample)

   a. Kind FT (fully tempered).

5. Indoor Lite: Clear (non-reflective):

   a. Kind FT (fully tempered).

6. Visible Light Transmittance: 48%.
7. Winter Nighttime U-Value: 0.28.
8. Summer Daytime U-Value: 0.26.
9. Solar Heat Gain Coefficient: 0.24.
10. Outdoor Visible Reflectance: 9%.

D. Insulating Coated spandrel and low-E Insulating-Glass IG (GT-4):

1. Products: Provide one of the following:

a. PPG Industries.
b. Libby Owens Ford.
c. AGC.

2. Exterior Glass Ply: ¼" Clear HS or FT.

a. Coating: VUE-50 on #2 Surface.
b. Airspace: $^1/_2$" airspace (finish - black painted).
c. Silicone: Black.
d. Interior Glass Ply: ¼" Clear HS or FT.
e. With Standard Color V908(Gray) #4 - full coverage Ceramic Frit.

3. Performance Requirements:

a. Visible Light Transmittance: N/A.
b. Exterior (Vis-Out) Reflectance: N/A.

2.9 FIRE-PROTECTION-RATED GLAZING TYPES

A. Glass Type GT-1: 60-minute fire-rated glazing; ceramic.

1. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Apply heel bead of elastomeric sealant.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 08 80 00

SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. General Contractor to provide:

1. All work associated with painting in this section.

B. This Section includes surface preparation and field painting of the following:

1. Exposed interior and exterior items and surfaces.
2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
3. Finish sealer on exposed concrete floor.

C. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Architectural casework.
b. Finished mechanical and electrical equipment (except as noted otherwise).
c. Light fixtures.
d. Distribution cabinets.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Foundation spaces.
b. Furred areas.
c. Ceiling plenums.
d. Utility tunnels.
e. Pipe spaces.
f. Duct shafts.

3. Finished metal surfaces include the following:

    a. Anodized aluminum.
    b. Stainless steel.
    c. Chromium plate.
    d. Copper.
    e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

    a. Valve and damper operators.
    b. Linkages.
    c. Sensing devices.
    d. Motor and fan shafts.

5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

E. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
2. Division 8 Section "Hollow Metal Doors and Frames" for shop priming steel doors and frames.
3. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.
4. Divisions 23 through 28: Painting of new mechanical and electrical work is specified in Divisions 15 and 16, respectively.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available and labeled for each type of finish-coat material indicated.

1. After color selection, furnish “draw-down” color chips for each color on manufacturer’s standard card stock.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.

B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:

1. Sherwin-Williams Co. (S-W) (Basis-of-Design).
2. Benjamin Moore & Co. (Moore).
3. PPG Industries, Inc. (PPG).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections indicated on the Drawings and quantities indicated on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

C. Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

    a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
    b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
    c. When transparent finish is required, backprime with spar varnish.
    d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
    e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

    a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
    b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions. Do not spray apply paint in rooms containing computers, telephone, security or data panels.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

H. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:

1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:

    a. Quantitative material analysis.
    b. Abrasion resistance.
    c. Apparent reflectivity.
    d. Flexibility.
    e. Washability.
    f. Absorption.
    g. Accelerated weathering.
    h. Dry opacity.
    i. Accelerated yellowness.
    j. Recoating.
    k. Skinning.
    l. Color retention.
    m. Alkali and mildew resistance.

3. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 INTERIOR PAINT SCHEDULE

A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Egg Shell Finish (to be used on walls, ceilings, soffits unless noted otherwise): 2 finish coats over a primer.

a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.

1) S-W ProMar 200 Zero VOC Latex Primer B28W2600 or equal product by approved manufacturer.

b. First and Second Coats: Eg-Shel, latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.6 mils dry per coat.

1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series or equal product by approved manufacturer.

B. Exposed Ferrous and Non Ferrous Metal: Provide the following finish systems over exposed ferrous metal:

1. Flat Finish: Two finish coats over a primer.

a. Primer: SW Pro Industrial Pro-Cryl Universal Primer, B66-310 Series or equal product by acceptable manufacturer.
b. First and Second Finish Coat: Flat finish applied at spreading rate recommended by the manufacturer.

1) S-W ProMar 200 Zero VOC Flat, B30-2600 Series or equal product by acceptable manufacturer.

C. Exposed Ferrous and Non Ferrous Metal Structure: Provide the following finish systems over exposed ferrous metal structure:

1. Semi-Gloss Finish (at exposed columns and bracing in Lobby spaces, door frames, and railings): Two finish coats over a primer.

a. Primer: SW Pro Industrial Pro-Cryl Universal Primer, B66-310 Series or equal product by acceptable manufacturer.
b. First and Second Finish Coat: Semi-Gloss finish applied at spreading rate recommended by the manufacturer.

1) S-W Pro Industrial Zero VOC Semi-Gloss Acrylic, B66-650 Series or equal product by acceptable manufacturer.

D. Concrete Masonry Surfaces (Semi-Gloss) – Water Based Light Industrial Coating system Sherwin Williams forms the basis of design:

1. Prime Coat: Primer sealer, latex, interior: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils wet, 3.2 mils dry.
2. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
3. Topcoat: Light industrial coating, interior, water based, semi-gloss: S-W Pro Industrial Pre-Catalyzed Water Based Epoxy, K46-151 Series, at 4.0 mils wet, 1.5 mils dry, per coat.
   a. Benjamin Moore
   b. PPG:
   c. Surfaces: Concrete block walls (except where otherwise called for in Room Finish Schedule).

3.8 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Quick-Drying Enamel System: MPI EXT 5.1A

a. Prime Coat: Quick-drying alkyd metal primer.
b. Intermediate Coat: Quick-drying enamel matching topcoat.
c. Topcoat: Quick-drying enamel (semigloss).

B. Galvanized-Metal Substrates:

1. Latex System: MPI EXT 5.3A.

a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Exterior latex matching topcoat.
c. Topcoat: Exterior latex (semigloss).

END OF SECTION 09 91 00

SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor shall provide:

a. Raceways.
b. Building wire, connectors, and splices for branch circuits and feeders.
c. Supporting devices for electrical components.
d. Electrical demolition.
e. Cutting and patching for electrical construction.
f. Touchup painting.
g. Firestopping.
h. Electrical identification.
i. Electricity and metering components.
j. Concrete equipment bases for transformers and large panels.

2. Alternate Bid:

a. None.

1.2 RELATED DOCUMENTS

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

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene rubber.

D. EMT: Electrical metallic tubing.

E. FMC: Flexible metal conduit.

F. IMC: Intermediate metal conduit.

G. LFMC: Liquidtight flexible metal conduit.

H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70 and all appendices.

1.6 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."

C. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

D. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

E. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

F. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.

2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

G. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

H. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.3 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Carbon steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4 RACEWAYS

A. EMT: ANSI C30.3, zinc-coated steel, with set-screw or compression fittings.

B. RMC: Galvanized heavy wall steel.

C. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.

D. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.

E. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings, or as noted on drawings.

F. Raceway Fittings: Specifically designed for the raceway type with which used.

2.5 CONDUCTORS

A. Conductors, No. 10 AWG and Smaller: Solid copper.

B. Conductors, Larger Than No. 10 AWG: Stranded copper.

C. Insulation: Thermoplastic, rated 90 deg C minimum.

D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.6 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Comply with Division 5 Section “Metal Fabrications” for slotted channel framing.

1. Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.
2. Channel Thickness: Selected to suit structural loading.
3. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (203 mm) o.c., in at least one surface.

1. Fittings and Accessories: Products of the same manufacturer as channels and angles.

2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.

E. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

H. Expansion Anchors: Carbon-steel wedge or sleeve type.

I. Toggle Bolts: All-steel springhead type.

J. Powder-Driven Threaded Studs: Heat-treated steel.

2.7 ELECTRICAL IDENTIFICATION – See Specification 26 05 53.

2.8 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

B. Meter Sockets: Comply with requirements of electrical power utility company.

2.9 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."

B. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.10 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

C. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

D. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

E. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

F. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

G. Cut sleeves to length for mounting flush with both surfaces of walls.

H. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

I. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.

J. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

K. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

L. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."

M. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

N. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

O. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 RACEWAY APPLICATION

A. Use the following raceways for outdoor installations:

1. Exposed: IMC.
2. Concealed: IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment: LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Use the following raceways for indoor installations:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
4. Damp or Wet Locations: IMC.
5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.
6. Below Slab: RNC (PVC Schedule 40) $^{3}/_{4}$" minimum diameter. Transition to metallic elbow before stubbing up. Underslab conduit to only be used where walls will be deemed permanent in areas on drawings.

3.5 RACEWAY AND CABLE INSTALLATION

A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors. Raceways shall be provided within walls for fire alarm, P/A, telephone data, security, power and lighting circuits with access to accessible ceiling areas.

B. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

C. Use temporary raceway caps to prevent foreign matter from entering.

D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.

F. Raceways identified on drawings as embedded in slabs shall be in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Install conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to rigid steel conduit, or IMC before rising above floor.
5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

H. Install telephone and signal system raceways, 2-inch trade size (DN53) and smaller, in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch (1830-mm) flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.6 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

A. Feeders: Type THHN/THWN insulated conductors in raceway.

B. Underground Feeders and Branch Circuits: Type THHN/THWN or single-wire, Type UF insulated conductors in raceway.

C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.

D. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.7 WIRING INSTALLATION

A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

B. Install wiring at outlets with at least 12 inches (300 mm) of slack conductor at each outlet.

C. Connect outlet and component connections to wiring systems and to ground. 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.

3.8 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Galvanized steel materials.

C. Support Clamps for PVC Raceways: Snap strap hanger, capable of allowing expansion and contraction of raceway.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.9 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
6. Steel: Welded threaded studs or spring-tension clamps on steel.

    a. Field Welding: Comply with AWS D1.1.

7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.10 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.11 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Refer to architectural plans for fire wall identifications. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.12 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.13 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.14 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

3.15 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.16 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

A. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.17 BASIS OF PAYMENT

A. Payment will be made to the Contractor at the end of unit price bid for structure and electric and data services complete and in place. Electric and data services measurements will be more between the centers of structures. Unit prices for electric and data services include all fittings and testing required.

END OF SECTION 26 05 00

SECTION 26 05 19 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor shall provide building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

B. Alternate Bid:

1. None.

1.2 RELATED DOCUMENTS

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

1. All Division 26 sections.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Quality-Control Test Reports: From Contractor.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70 and all appendices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

A. Manufacturers:

1. Alcan Aluminum Corporation; Alcan Cable Div.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5 solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THHN-THWN complying with NEMA WC 5.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

H. Underground Feeders and Branch Circuits: Type THHN-THWN, single conductors in raceway.

I. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.

J. Fire Alarm Circuits: See Section 28 31 11 for installation requirements.

K. Class 1 Control Circuits: Type THHN-THWN, in raceway.

L. Class 2 Control Circuits: Power-limited cable, concealed in building finishes. Power-limited tray cable, in cable tray.

3.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. 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.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Basic Electrical Materials and Methods."

F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

G. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

H. Provide a ground conductor in all feeder and branch circuits.

3.3 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 and UL 486B.

B. Make splices 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 and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

A. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.5 BASIS OF PAYMENT

A. Payment will be made to the Contractor at the end of unit price bid for electrical services complete and in place. Electrical services measurements will be more between the centers of structures. Unit prices for electrical data services include all splices, fittings, terminations and testing required.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor shall provide grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Section of these Specifications.

B. Alternate Bid:

1. None.

1.2 RELATED DOCUMENTS

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

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. See Section 26 05 19 “Conductors and Cables” for additional requirements for grounding conductors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Data: For the following:

1. Ground rods.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

D. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

C. Comply with NFPA 70 and all appendices; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection

system. PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:

a. Apache Grounding/Erico Inc.
b. Boggs, Inc.
c. Chance/Hubbell.
d. Copperweld Corp.
e. Dossert Corp.
f. Erico Inc.; Electrical Products Group.
g. Framatome Connectors/Burndy Electrical.
h. Galvan Industries, Inc.
i. Harger Lightning Protection, Inc.
j. Hastings Fiber Glass Products, Inc.
k. Heary Brothers Lightning Protection Co.
l. Ideal Industries, Inc.
m. ILSCO.
n. Kearney/Cooper Power Systems.
o. Korns: C. C. Korns Co.; Division of Robroy Industries.
p. Lightning Master Corp.
q. Lyncole XIT Grounding.
r. O-Z/Gedney Co.; a business of the EGS Electrical Group.
s. Raco, Inc.; Division of Hubbell.
t. Robbins Lightning, Inc.
u. Salisbury: W. H. Salisbury & Co.
v. Superior Grounding Systems, Inc.
w. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section 26 05 19 "Conductors and Cables."

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

H. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch (6.4 mm) in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches (42 mm) wide and 1/16 inch (1.5 mm) thick.

I. Ground Conductor and Conductor Protector for Wood Poles: As follows:

1. No. 4 AWG minimum, soft-drawn copper conductor.
2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.

J. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators. Size as indicated on drawings.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors. Compression type may be used on ground bus only.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

B. Ground Rods: Sectional type; copper-clad steel.

1. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter and length.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Flexible raceway runs.

D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

E. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

F. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

G. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable.
Bond conductor to heater units, piping, connected equipment, and components.

H. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

I. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 COUNTERPOISE

A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches (450 mm) below grade and 24 inches (600 mm) from building foundation.

3.4 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a

bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

3.5 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding 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 and UL 486B.

F. Compression-Type Connections (where indicated in this section): Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard

method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.6 OVERHEAD-LINE GROUNDING

A. Comply with IEEE C2 requirements. Use 2 or more parallel ground rods if a single ground rod electrode resistance to ground exceeds 25 ohms.

B. Drive ground rods to a depth of 12 inches (300 mm) below finished grade in undisturbed earth.

C. Ground Rod Connections: Use clamp-type connectors listed for the purpose for underground connections and connections to rods.

D. Lightning Arresters: Separate arrester grounds from other grounding conductors.

E. Secondary Neutral and Tank of Transformer: Interconnect and connect to grounding conductor.

F. Protect grounding conductors running on surface of wood poles with molding extended from grade level up to and through communication service and transformer spaces.

3.7 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

B. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

C. Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches (450 mm) below grade and 6 inches (150 mm) from the foundation.

3.8 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

    a. Equipment Rated 500 kVA and Less: 10 ohms.
    b. Equipment Rated 500 to 1000 kVA: 5 ohms.
    c. Equipment Rated More Than 1000 kVA: 3 ohms.
    d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
    e. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.9 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by Work of this Section. Reestablish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 26 05 26

SECTION 26 05 29 - ELECTRICAL SUPPORTS AND SEISMIC RESTRAINTS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor shall provide seismic restraint for panelboards, light fixtures, conduit over 2” in diameter, and other equipment mentioned in Paragraph 3.4.B.

B. Alternate Bid:

1. None.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Seismic restraints for electrical equipment and systems.
3. Construction requirements for concrete bases.

1.4 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IBC: International Building Code.

C. IMC: Intermediate metal conduit.

D. NBC: National Building Code.

E. OSHPD: Office of Statewide Health Planning and Development.

F. RMC: Rigid metal conduit.

G. SBC: Standard Building Code.

H. Seismic Restraint: A structural support element such as a metal framing member, a cable, an anchor bolt or stud, a fastening device, or an assembly of these items used to transmit seismic forces from an item of equipment or system to building structure and to limit movement of item during a seismic event.

I. UBC: Uniform Building Code.

1.5 SUBMITTALS

A. Product Data: Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of electrical support and seismic-restraint component used.

1. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
2. Annotate to indicate application of each product submitted and compliance with requirements.

B. Shop Drawings: Indicate materials and dimensions and identify hardware, including attachment and anchorage devices, signed and sealed by a qualified professional engineer. Professional engineer qualification requirements are specified in Division 1 Section "Quality Requirements." Include the following:

1. Fabricated Supports: Representations of field-fabricated supports not detailed on Drawings.
2. Seismic Restraints: Detail anchorage and bracing not defined by details or charts on Drawings. Include the following:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Detail fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events.
c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

C. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

D. Welding certificates.

E. Qualification Data: For professional engineer and testing agency.

F. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the BOCA unless requirements in this Section are more stringent.

B. Testing of Seismic Anchorage Devices: Comply with testing requirements in Part 3 and in Division 26 Section "Basic Electrical Materials and Methods."

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

A. Soil Profile Type: See Soils Report.

B. Acceleration Factor as Defined in BOCA: .15.

C. Project Seismic Hazard Exposure Group as Defined in BOCA: II.

1.8 COORDINATION

A. Coordinate layout and installation of seismic bracing with building structural system and architectural features, and with mechanical, fire-protection, electrical, and other building features in the vicinity.

B. Coordinate concrete bases with building structural system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed under this Project, with a minimum structural safety factor of five times the applied force.

B. Steel Slotted Support Systems: Comply with MFMA-3, factory-fabricated components for field assembly.

1. Manufacturers:

a. Cooper B-Line; a division of Cooper Industries.
b. ERICO International Corporation.
c. Allied Support Systems; Power-Strut Unit.
d. GS Metals Corp.
e. Michigan Hanger Co., Inc.; O-Strut Div.
f. National Pipe Hanger Corp.
g. Thomas & Betts Corporation.
h. Unistrut; Tyco International, Ltd.

i. Wesanco, Inc.

2. Finishes:

a. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-3.
b. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-3.
c. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-3.

3. Channel Dimensions: Selected for structural loading and applicable seismic forces.

C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.

1. Manufacturers:

a. Allied Support Systems; Aickinstrut Unit.
b. Cooper B-Line; a division of Cooper Industries.
c. Fabco Plastics Wholesale Limited.
d. Seasafe, Inc.

2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
3. Fitting and Accessory Materials: Same as channels and angles.
4. Rated Strength: Selected to suit structural loading and applicable seismic forces.

D. Raceway and Cable Supports: As described in NECA 1.

E. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

F. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

G. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

H. 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:

1) Hilti, Inc.
2) ITW Construction Products.

3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co. Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Manufacturers:

1) Cooper B-Line; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc
3) Hilti, Inc.
4) ITW Construction Products.
5) MKT Fastening, LLC.
6) Powers Fasteners.

3. Concrete Inserts: Steel or malleable-iron slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 SEISMIC-RESTRAINT COMPONENTS

A. Rated Strength, Features, and Application Requirements for Restraint Components: As defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Strength in tension, shear, and pullout force of components used shall be at least five times the maximum seismic forces to which they will be subjected.

B. Angle and Channel-Type Brace Assemblies: Steel angles or steel slotted-support-system components; with accessories for attachment to braced component at one end and to building structure at the other end.

C. Cable Restraints: ASTM A 603, zinc-coated, steel wire rope attached to steel or stainless-steel thimbles, brackets, swivels, and bolts designed for restraining cable service.

1. Manufacturers:

a. Amber/Booth Company, Inc.
b. Loos & Co., Inc.
c. Mason Industries, Inc.

2. Seismic Mountings, Anchors, and Attachments: Devices as specified in Part 2 "Support, Anchorage, and Attachment Components" Article, selected to resist seismic forces.
3. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod, of design recognized by an agency acceptable to authorities having jurisdiction.

4. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to type and size of anchor bolts and studs used.
5. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to type and size of attachment devices used.

2.4 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 for application of hangers and supports for electrical equipment and systems, except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.
2. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT AND SEISMIC-RESTRAINT INSTALLATION

A. Comply with NECA 1 for installation requirements, except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Install seismic-restraint components using methods approved by the evaluation service providing required submittals for component.

D. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

E. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

F. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

G. See Section 26 51 19 for light fixture anchoring requirements.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 5 Section "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.

3.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and seismic criteria at Project.

B. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so expansion anchors will be a minimum of 10 bolt diameters from edge of the base.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of the base.
2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
6. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."

3.5 INSTALLATION OF SEISMIC-RESTRAINT COMPONENTS

A. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Restraint Cables: Provide slack within maximums recommended by manufacturer.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

3.6 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Make flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross expansion and seismic-control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to electrical equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.7 FIELD QUALITY CONTROL

A. Testing: Test pullout resistance of seismic anchorage devices.

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.

6. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

B. Record test results.

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical contractor shall provide raceways, fittings, boxes, enclosures, and cabinets for electrical wiring and circuitry associated with this project.

a. Raceways include the following:

1) RMC.
2) IMC.
3) EMT.
4) LFMC.
5) RNC.
6) Wireways.
7) Surface raceways.

b. Boxes, enclosures and cabinets include the following:

1) Device boxes.
2) Outlet boxes.
3) Pull and junction boxes.
4) Cabinets and hinged-cover enclosures.
5) Floor boxes.

B. Alternate Bid:

1. None.

1.2 RELATED DOCUMENTS

A. Related Sections include the following:

1. Division 7 Section “Firestopping.”
2. Division 26 Section “Basic Electrical Materials and Methods” for raceways and box supports.

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

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

C. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70 and all appendices.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. Aluminum Rigid Conduit: ANSI C80.5.

D. IMC: ANSI C80.6.

E. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw or compression steel type.

F. FMC: Zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket.

H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.
6. Condux International.

7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiralduct, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

D. Support Clamps for PVC Raceways: Snap type hanger, capable of allowing expansion and contraction of raceway.

2.4 METAL WIREWAYS

A. Manufacturers:

1. Hoffman.
2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Screw-cover type.

F. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS

A. Manufacturers:

1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.6 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.

1. Manufacturers:

a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
b. Thomas & Betts Corporation.
c. Walker Systems, Inc.; Wiremold Company (The).
d. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.

1. Manufacturers:

a. Butler Manufacturing Co.; Walker Division.
b. Enduro Composite Systems.
c. Hubbell, Inc.; Wiring Device Division.
d. Lamson & Sessions; Carlon Electrical Products.
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The).
g. Wiremold Company (The); Electrical Sales Division.

C. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).

13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

E. Floor Boxes: Cast metal, fully adjustable, rectangular. Provide carpet flange with brass cover plates that can be closed flush with cabling or receptacle usage.

F. Floor Boxes: Nonmetallic, nonadjustable, round.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

J. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.8 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT.

2. Concealed: EMT or RNC (installed below slab on grade).
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

    a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Minimum Raceway Size: 3/4-inch trade size (DN 21).

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Below Slabs: Install below slab and leave at least 2 inches (50 mm) of rock cover except where conduit penetrates the surface.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during rock placement.
2. Space raceways laterally to prevent voids in rockl.
3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

4. Change from nonmetallic tubing to rigid steel conduit, before rising above the floor.

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

K. Tighten set screws of threadless fittings with suitable tools.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

N. Telephone and Signal System Raceways, 2-Inch Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

Q. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

S. Set floor boxes level and flush with finished floor surface.

T. Set floor boxes level. Trim after installation to fit flush with finished floor surface.

U. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

V. Height of outlets and devices are indicated on the drawings. Comply with “Americans with Disabilities Act” (ADA).

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

3.5 BASIS OF PAYMENT

A. Payment will be made to the Contractor at the end of unit price bid for structure and electric and data services complete and in place. Electric and data services measurements will be more between the centers of structures. Unit prices for electric and data services include all fittings and testing required.

END OF SECTION 26 05 33

SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL

SYSTEMS PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Concrete-encased conduit, ducts, and duct accessories.
3. Handholes and boxes.
4. Manholes.

1.3 DEFINITIONS

A. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include duct-bank materials, including separators and miscellaneous components.
2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Include accessories for manholes, handholes, boxes, and other utility structures.
4. Include warning tape.
5. Include warning planks.

B. Shop Drawings:

1. Precast or Factory-Fabricated Underground Utility Structures:

a. Include plans, elevations, sections, details, attachments to other work, and accessories.
b. Include duct entry provisions, including locations and duct sizes.
c. Include reinforcement details.
d. Include frame and cover design and manhole frame support rings.
e. Include Ladder details.
f. Include grounding details.
g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
h. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

   a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
   b. Include duct entry provisions, including locations and duct sizes.
   c. Include cover design.
   d. Include grounding details.
   e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.5 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

   1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
   2. Drawings shall be signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 MAINTENANCE MATERIALS SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Furnish cable-support stanchions, arms, insulators, and associated fasteners in quantities equal to 5 percent of quantity of each item installed.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

1.8 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:

   1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without Construction Manager's and Owner's written permission.

B. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

C. Ground Water: Assume ground-water level is 36 inches (900 mm) below ground surface unless a higher water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

A. Comply with ANSI C2.

2.2 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers:

1. ARNCO Corporation.
2. Beck Manufacturing.
3. CANTEX, Inc.
4. CertainTeed Corporation.
5. Condux International, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX USA, LLC.
9. Lamson & Sessions.
10. Manhattan/CDT.
11. Spiraduct/AFC Cable Systems, Inc.

B. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-80 and Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.

C. Underground Plastic Utilities Duct: NEMA TC 6 & 8, ASTM F 512, UL 651A, Type HDPE and Type EB-20-PVC, with matching fittings complying with NEMA TC 9 by same manufacturer as the duct.

D. Underground Plastic Utilities Duct: NEMA TC 6 & 8, ASTM F 512, Type DB-60-PVC and Type DB-120-PVC, for direct burial, with matching fittings complying with NEMA TC 9 by same manufacturer as the duct.

E. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."
3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 75 mm) in size, manufactured from 6000-psi (41-MPa) concrete.

    a. Color: Red dye added to concrete during batching.
    b. Mark each plank with "ELECTRIC" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

2.4 PRECAST CONCRETE HANDHOLES AND BOXES

A. Manufacturers:

1. Christy Concrete Products.
2. Elmhurst-Chicao Stone Co.
3. Oldcastle Precast, Inc.
4. Rinker Group, Ltd.
5. Riverton Concrete Products.
6. Utility Concrete Products, LLC.
7. Utility Vault Co.
8. Wausau Tile, Inc.

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.

1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
2. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
3. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.

    a. Cover Hinges: Concealed, with hold-open ratchet assembly.
    b. Cover Handle: Recessed.

4. Frame and Cover: Weatherproof aluminum frame with hinged aluminum access door assembly with tamper-resistant, captive, cover-securing bolts.

    a. Cover Hinges: Concealed, with hold-open ratchet assembly.
    b. Cover Handle: Recessed.

5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC." As indicated for each service.

7. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
8. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

    a. Extension shall provide increased depth of 12 inches (300 mm).
    b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

9. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
10. Windows: Precast openings in walls, arranged to match dimensions and elevations of approaching ducts and duct banks, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.

    a. Windows shall be located no less than 6 inches (150 mm) from interior surfaces of walls, floors, or frames and covers of handholes, but close enough to corners to facilitate racking of cables on walls.
    b. Window opening shall have cast-in-place, welded-wire fabric reinforcement for field cutting and bending to tie in to concrete envelopes of duct banks.
    c. Window openings shall be framed with at least two additional No. 3 steel reinforcing bars in concrete around each opening.

11. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

    a. Type and size shall match fittings to duct or conduit to be terminated.
    b. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

12. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.5 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. General Requirements for Handholes and Boxes: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
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 shall mate with entering ducts for secure, fixed installation in enclosure wall.

8. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Manufacturers:

a. Armorcast Products Company.
b. Carson Industries, LLC.
c. NewBasis.
d. Quazite: Hubbell Power Systems, Inc.

C. Fiberglass Handholes and Boxes with Polymer Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.

1. Manufacturers:

a. Armorcast Products Company.
b. Carson Industries, LLC.
c. Christy Concrete Products.
d. Quazite: Hubbell Power Systems, Inc.
e. Synertech Moulded Products.

D. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers made of polymer concrete.

1. Manufacturers:

a. Carson Industries, LLC.
b. Christy Concrete Products.
c. Nordic Fiberglass, Inc.
d. Quazite: Hubbell Power Systems, Inc.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of manholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts 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 runs drain to manholes and handholes, and as approved by Architect.

C. Clear and grub vegetation to be removed, and protect vegetation to remain according to Section 311000 "Site Clearing." Remove and stockpile topsoil for reapplication according to Section 311000 "Site Clearing."

3.2 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80-PVC, in direct-buried duct bank unless otherwise indicated.

C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-80-PVC, in direct-buried duct bank unless otherwise indicated.

D. Underground Ducts Crossing Paved Paths, Walks, Driveways, and Roadways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.3 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:

1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
2. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
3. Units Subject to Light-Duty Pedestrian Traffic Only: High-density plastic, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
4. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. 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 329200 "Turf and Grasses" and Section 329300 "Plants."

D. Cut and patch existing pavement in the path of underground ducts and utility structures according to the "Cutting and Patching" Article in Section 017300 "Execution."

3.5 DUCT INSTALLATION

A. Install ducts according to NEMA TCB 2.

B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.

C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.

D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

E. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches (250 mm) o.c. for 5-inch (125-mm) ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch (19 mm).
3. Grout end bells into structure walls from both sides to provide watertight entrances.

F. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

G. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

H. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in empty ducts.

I. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.

2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Space separators close enough to prevent sagging and deforming of ducts, with not less than five spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches (150 mm) between tiers.
4. Depth: Install top of duct bank at least 36 inches (900 mm) below finished grade unless otherwise indicated.
5. Set elevation of bottom of duct bank below frost line.
6. Install ducts with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and signal ducts.
7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

9. After installing first tier of ducts, 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 inches (100 mm) over ducts 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 312000 "Earth Moving" for installation of backfill materials.

    a. Place minimum 3 inches (75 mm) of sand as a bed for duct bank. Place sand to a minimum of 6 inches (150 mm) above top level of duct bank.
    b. Place minimum 6 inches (150 mm) of engineered fill above concrete encasement of duct bank.

J. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried ducts and duct banks, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional planks 12 inches (300 mm) apart, horizontally.

K. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.6 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:

1. Comply with ASTM C 891 unless otherwise indicated.
2. Install units level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances.
3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:

1. Install handholes with bottom below frost line, 42 inches (1067 mm) below grade.
2. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
3. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

D. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Waterproofing materials and installation are specified in Section 071353 "Elastomeric Sheet Waterproofing." After ducts have been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

E. Dampproofing: Apply dampproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Section 071113 "Bituminous Dampproofing." After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.

F. Hardware: 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.

G. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 37/8 inches (97 mm) for manholes and 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

3.7 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below frost line, 42 inches (1067 mm) below grade.

E. 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.

F. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

3.8 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- (150-mm-) long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.10 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

A. Clean internal surfaces of manholes, including sump. Remove foreign material.

3.11 BASIS OF PAYMENT

A. Payment will be made to the Contractor at the end of unit price bid for structure and electric and data services complete and in place. Electric and data services measurements will be more between the centers of structures. Unit prices for electric and data services include all fittings and testing required.

END OF SECTION 26 05 43

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor shall provide electrical identification materials and devices required to comply with ANSI C2, NFPA 70, and authorities having jurisdiction.

B. Alternate Bid:

1. None.

1.2 RELATED DOCUMENTS

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

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70 and all appendices.

C. Comply with 29 CFR 1910.145.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:

1. Power Circuits: Black letters on an orange field.
2. Legend: Indicate system or service and voltage, if applicable.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- (0.35-mm-) thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength: 50 lb (22.6 kg), minimum.
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.

1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Exterior concrete and masonry primer.
2) Finish Coats: Exterior semigloss acrylic enamel.

2. Exterior Concrete Unit Masonry:

a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.

1) Block Filler: Concrete unit masonry block filler.
2) Finish Coats: Exterior semigloss acrylic enamel.

3. Exterior Ferrous Metal:

a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Exterior ferrous-metal primer.
2) Finish Coats: Exterior semigloss alkyd enamel.

4. Exterior Zinc-Coated Metal (except Raceways):

a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

1) Primer: Exterior zinc-coated metal primer.
2) Finish Coats: Exterior semigloss alkyd enamel.

5. Interior Concrete and Masonry (Other Than Concrete Unit Masonry):

   a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

      1) Primer: Interior concrete and masonry primer.
      2) Finish Coats: Interior semigloss alkyd enamel.

6. Interior Concrete Unit Masonry:

   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.

      1) Block Filler: Concrete unit masonry block filler.
      2) Finish Coats: Interior semigloss acrylic enamel.

7. Interior Gypsum Board:

   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

      1) Primer: Interior gypsum board primer.
      2) Finish Coats: Interior semigloss acrylic enamel.

8. Interior Ferrous Metal:

   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

      1) Primer: Interior ferrous-metal primer.
      2) Finish Coats: Interior semigloss acrylic enamel.

9. Interior Zinc-Coated Metal (except Raceways):

   a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.

      1) Primer: Interior zinc-coated metal primer.
      2) Finish Coats: Interior semigloss acrylic enamel.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Raceways and Duct Banks More Than 600 V Concealed within Buildings: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:

   1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
   2. Wall surfaces directly external to raceways concealed within wall.

3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways and Metal-Clad Cables More Than 600 V: Identify with "DANGER-HIGH VOLTAGE" in black letters at least 2 inches (50 mm) high, with self-adhesive vinyl labels. Repeat legend at 10-foot (3-m) maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange self-adhesive vinyl label.

D. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands:

1. Fire Alarm System: Red.
2. Fire-Suppression Supervisory and Control System: Red and yellow.
3. Combined Fire Alarm and Security System: Red and blue.
4. Security System: Blue and yellow.
5. Mechanical and Electrical Supervisory System: Green and blue.
6. Telecommunication System: Green and yellow.
7. Control Wiring: Green and red.

E. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

F. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use marker tape. Identify each ungrounded conductor according to source and circuit number.

G. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source and circuit number.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

K. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

    a. Panelboards, electrical cabinets, and enclosures.
    b. Access doors and panels for concealed electrical items.
    c. Transformers.
    d. Emergency system boxes and enclosures.
    e. Disconnect switches.
    f. Enclosed circuit breakers.
    g. Motor starters.
    h. Push-button stations.
    i. Contactors.
    j. Remote-controlled switches, dimmer modules, and control devices.
    k. Battery inverter units.
    l. Voice and data cable terminal equipment.
    m. Fire-alarm control panel and annunciators.

n. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

H. Circuit Identification Labels on Boxes: Install labels externally.

1. Exposed Boxes: Permanent, waterproof marker labeling on exterior cover.
2. Concealed Boxes: Plasticized card-stock tags.
3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

I. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 240/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Neutral: White.
    d. Ground: Green.

3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

J. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

K. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

L. Painted Identification: Prepare surface and apply paint according to Division 9 painting

Sections. END OF SECTION 26 05 53

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

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. Photoelectric switches.
2. Indoor occupancy sensors.
3. Lighting contactors.

B. Related Requirements:

1. Section 26 27 26 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers:

1. Crestron.
2. Hubbelll Building Automation.
3. Watt-Stopper.

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
3. Time Delay: Fifteen second minimum, to prevent false operation.
4. Surge Protection: Metal-oxide varistor.
5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.2 INDOOR OCCUPANCY SENSORS

A. Manufacturers:

1. Crestron.
2. Hubbelll Building Automation.
3. Watt-Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 108-inch- (2743-mm-) high ceiling.

2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers:

1. Crestron.
2. Hubbelll Building Automation.
3. Watt-Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).

C. Wall-Switch Sensor Tag OS:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 1000 sq. ft. (92 sq. m).
2. Sensing Technology: Dual technology-pir and ultrasound.
3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: 120 V; dual technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

D. Wall-Switch Sensor Tag OSD:

1. Standard Range: 180-degree field of view, with a minimum coverage area of 1000 sq. ft. (92 sq. m).
2. Sensing Technology: PIR.
3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: 120 V; passive-infrared type.

5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 500 fc (108 to 5400 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Dimming: 0-10 V, 3-wire.

2.4 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 26 05 19 " Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Lighting control devices will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in Section 26 09 43.13 "Addressable-Fixture Lighting Controls" and Section 26 09 43.23 "Relay-Based Lighting Controls."

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

3.8 BASIS OF PAYMENT

A. Payment will be made to the Contractor at the end of unit price bid for structure and electric and data services complete and in place. Electric and data services measurements will be more between the centers of structures. Unit prices for electric and data services include all fittings and testing required.

END OF SECTION 26 09 23

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor shall provide panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less.

B. Alternate Bid:

1. None.

1.2 RELATED DOCUMENTS

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

B. Related Sections:

1. Division 26 Section “Seismic Controls for Electrical Work.”

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.

b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. UL listing for series rating of installed devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Seismic Controls for Electrical Work." Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For testing agency.

E. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

G. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70 and all appendices.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's and Owner's written permission.

1.7 COORDINATION

A. 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, and encumbrances to workspace clearance requirements.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. Eaton Corporation; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Protection Div.
c. Siemens Energy & Automation, Inc.
d. Square D.

2.2 MANUFACTURED UNITS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work."

B. Enclosures: Surface-mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3R.
b. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
c. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.
7. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
8. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

C. Phase and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
3. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.
4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

D. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Mechanical type.
2. Ground Lugs and Bus Configured Terminators: Compression type.
3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
4. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

F. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

B. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Division 16 Section "Electrical Power Monitoring and Control."
5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
10. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Furnish portable test set to test functions of solid-state trip devices without removal from panelboard.

C. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."

C. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

E. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section “Electrical Identification."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scanning of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.6 BASIS OF PAYMENT

A. Payment will be made to the Contractor at the end of unit price bid for structure and electric and data services complete and in place. Electric and data services measurements will be more between the centers of structures. Unit prices for electric and data services include all fittings and testing required.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor shall provide receptacles, connectors, switches, and finish plates.

B. Alternate Bid:

1. None.

1.2 RELATED DOCUMENTS

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

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70 and all appendices.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

a. Bryant Electric, Inc./Hubbell Subsidiary.
b. Eagle Electric Manufacturing Co., Inc.
c. Hubbell Incorporated; Wiring Device-Kellems.
d. Leviton Mfg. Company Inc.
e. Pass & Seymour/Legrand; Wiring Devices Div.

2. Multioutlet Assemblies:

a. Hubbell Incorporated; Wiring Device-Kellems.
b. Wiremold Company (The).

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.

B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.

C. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

2.3 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.4 SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

B. Snap Switches: Heavy-Duty grade, quiet type.

C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

1. Switch: 20 A, 120/277-V ac.
2. Receptacle: NEMA WD 6, Configuration 5-15R.

2.5 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.6 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

B. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

C. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

D. Remove wall plates and protect devices and assemblies during painting.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

C. 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 and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

A. Remove malfunctioning units, replace with new units, and retest as specified above.

3.5 BASIS OF PAYMENT

A. Payment will be made to the Contractor at the end of unit price bid for structure and electric and data services complete and in place. Electric and data services measurements will be more between the centers of structures. Unit prices for electric and data services include all fittings and testing required.

END OF SECTION 26 27 26

SECTION 26 51 19 - LED INTERIOR LIGHTING

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. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.

6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project, IES LM-79, and IES LM-80.

    a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
    b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches (300 mm) of the plane of the luminaires.
4. Structural members to which equipment and luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:

    a. Other luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Ceiling-mounted projectors.

7. Moldings.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of luminaire.

F. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

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 for hazardous locations 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. Recessed Fixtures: Comply with NEMA LE 4.

E. Bulb shape complying with ANSI C79.1.

F. Lamp base complying with ANSI C81.61.

G. CRI of minimum 80. CCT of 4000 K.

H. Rated lamp life of minimum 50,000 hours.

I. Lamps dimmable from 100 percent to 0 percent of maximum light output.

J. Internal driver.

K. Nominal Operating Voltage: 120 V ac.

1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

L. Housings:

1. Extruded-aluminum housing and heat sink.
2. Painted finish.

2.3 DOWNLIGHT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. Minimum allowable efficacy of 80 lumens per watt.

C. Universal mounting bracket.

D. Integral junction box with conduit fittings.

E. Refer to Lighting Fixture Schedule.

2.4 LINEAR INDUSTRIAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. Minimum allowable efficacy of 80 lumens per watt.

C. Refer to Lighting Fixture Schedule.

2.5 STRIP LIGHT

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. Minimum allowable efficacy of 80 lumens per watt.

C. Integral junction box with conduit fittings.

D. Refer to Lighting Fixture Schedule.

2.6 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

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.

C. Diffusers and Globes:

1. Type per fixture. Refer to Lighting Fixture Schedule.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Painted finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels 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. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.7 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.8 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Electrical Supports and Seismic Retraints" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

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 fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached using through bolts and backing plates on either side of wall.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch- (4-mm-) diameter aircraft cable supports adjustable to 36 inches (1 m) in length.
6.

H. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Electrical Identification."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 26 09 23 "Lighting Control Devices."

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 26 51 19

SECTION 26 56 19 - EXTERIOR LIGHTING

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. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multi-pole lighting relays and contactors.

1.3 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.

1.4 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. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The

adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project, IES LM-79, and IES LM-80.

a. Manufacturer's Certified Data: Photometric data certified by manufacturer?s laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Wiring diagrams for power, control, and signal wiring.
7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that the attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports and seismic restraints.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Structural members to which equipment and luminaires will be attached.
3. Underground utilities and structures.
4. Existing underground utilities and structures.
5. Above-grade utilities and structures.
6. Existing above-grade utilities and structures.
7. Building features.
8. Vertical and horizontal information.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

E. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.

F. Source quality-control reports.

G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and photoelectric relays to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

E. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping.

1.10 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.

1.11 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including luminaire support components.
b. Faulty operation of luminaires and accessories.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five year(s) from date of Substantial

Completion. PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

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. UL Compliance: Comply with UL 1598 and listed for wet location.

C. Lamp base complying with ANSI C81.61.

D. Bulb shape complying with ANSI C79.1.

E. CRI of minimum 80. CCT of 4000 K.

F. L70 lamp life of minimum 50,000 hours.

G. Lamps dimmable from 100 percent to 0 percent of maximum light output.

H. Internal driver.

I. Nominal Operating Voltage: 120 V ac.

J. In-line Fusing: Separate in-line fuse for each luminaire.

K. Lamp Rating: Lamp marked for outdoor use and in enclosed locations.

L. Source Limitations: Obtain luminaires from single source from a single manufacturer.

M. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. Refer to Lighting Fixture Schedule for exterior luminaire styles, shapes, mountings, distributions, and materials.

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C. 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.

D. 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.

2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch ((3.175 mm)) minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

H. 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. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.5 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

a. Color: As selected from manufacturers standard catalog of colors.

D. 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.

a. Color: As selected from manufacturer's standard catalog of colors.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 05 29 "Electrical Supports and Seismic Retraints" 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, and overhang ceilings 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 the 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. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. 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.

F. Wall-Mounted Luminaire Support:

1. Attached using through bolts and backing plates on either side of wall.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

K. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.4 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top 4 inches (100 mm) above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 30 00 "Cast-in-Place Concrete."

3.5 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 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

a. IES LM-5.
b. IES LM-50.
c. IES LM-52.
d. IES LM-64.
e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.9 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 26 56 19

SECTION 26 95 00 - TESTING

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor shall provide:

a. Testing of electrical components and systems:

1) Insulation resistance test
2) Grounding electrode test
3) Continuity test
4) Voltage test
5) Phase relationship verification
6) Fire alarm acceptance test.

b. Test reports
c. Correction of defective components or system
d. Retest of corrected components, systems.

B. Alternate Bids:

1. None

1.2 RELATED DOCUMENTS

A. Specified elsewhere:

1. 01 33 00 - Shop Drawings, Product Data and Samples
2. 01 77 00 - Contract Closeout: Closeout Submittals
3. 01 78 39 - Project Record Documents
4. 07 78 23 - Operating and Maintenance Manuals
5. 26 05 00 - Basic Electrical Materials & Methods
6. 26 05 26 - Grounding and Bonding
7. 26 29 13 - Enclosed Controllers

1.3 SUBMITTALS

A. Test Reports: Submit three (3) copies of all test reports to Architect/Engineer.

1. Type each test report on 8-1/2” x 11” paper. Include the following:

a. Project title and location.
b. Test performed
c. Date performed
d. Test equipment used

e. Electrical Contractor's name, address, and telephone number
f. Testing firm's name, address, and telephone number, if other than Electrical Contractor.
g. Names and titles of persons:

1) Performing test
2) Observing test

h. Statement verifying each test.
i. Nameplate data from each motor and equipment item tested
j. Test results.
k. Retest results after correction of defective components, systems.

2. For each copy, assemble all test reports and bind them in a folder. Label each folder, "Electrical Test Reports" and include Title and Location.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish all equipment, manpower and casual labor to perform specified testing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that all electrical work is complete and ready for testing.

B. Disconnect all devices or equipment that might be damaged by application of test voltages, voltage of reversed phase sequence or other test procedures.

3.2 TESTING

A. Conduct test and adjust equipment to verify compliance with specified performance.

3.3 INSULATION RESISTANCE TEST

A. Resistance measured; line-to-ground.

B. Perform testing on the following items.

Item Tested		Voltage of	Minimum Acceptance Resistance in Megohms
1.	No. 2 and Larger Cables (600v)	1000v	50
2.	Motors	500v	5
3.	Switchboard, Motor, Control Center and Panelboard Buses	1000v	25

3.4 GROUNDING ELECTRODE TESTS

A. Measure and record ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Maximum acceptable resistance: 10 ohms. When resistance exceeds 10 ohms drive and bond another ground rod, one ground rod length away and repeat test.

3.5 CONTINUITY TEST

A. Test branch circuits and control circuits to determine continuity of wiring and connection.

3.6 VOLTAGE TEST

A. Make and record voltage test and recorded at the following listed points. Conduit tests under normal load conditions.

1. Service entrance at main disconnect switch.
2. Secondary terminals of all step down transformers.
3. Terminal of all motors.

3.7 PHASE RELATIONSHIP

A. Examine connections to equipment for proper phase relationships. Verify proper motor rotation.

3.8 FIRE ALARM ACCEPTANCE TEST

A. Have the fire alarm acceptance test performed by the Alarm Company Representative and installation contractor in the presence of the Using Agency's Fire Safety Coordinate for the facility.

B. Acceptable Test Procedures:

Panel/Receiving Station	Expected Indication on Premises and Remote Station
1. Normal Power to Panel	Secure/Normal
2. Disconnect Power to Panel	Trouble
3. Activate Detection Device	Alarm
4. Silence Alarm Signaling Device	Trouble
5. Return Normal Power to Panel and Reset Panel	Secure/Normal
6. Place Each Function Switch in an Abnormal Position	Trouble
7. Remove Supervised Devices from System (During this Portion of Testing, Ensure Proper Wire Has Been Used and Devices Are Properly Installed)	
8. Return Supervised Device to System	Secure/Normal
9. Disconnect Normal Power to Panel	Trouble
10. Activate Detector(s) for Each Zone	Alarm
11. Inspect All Horns/Bells, Zone Indication, and Auxiliary Devices	Working List

	Panel/Receiving Station	Expected Indication on Premises and Remote Station
5.	Silence Horns/Bells	Alarm/Trouble
6.	Reset System	Secure/Normal
7.	Place Panel in Alarm Condition. Disconnect Primary Power Source for a Minimum of 15 Seconds and Return to Normal Power (the Above Transfer Procedures Shall Not Cause a Loss of an Alarm Condition at Receiving Station)	

3.9 SECURITY TESTING

A. Provide security testing following applicable procedures stated for fire alarm system test.

3.10 CORRECTION OF DEFECTS

A. When tests disclose any unsatisfactory workmanship o equipment furnished under this Contract, correct defects and retest. Repeat tests until satisfactory results are obtained.

B. When any wiring or equipment is damaged by test, repair or replace such wiring or equipment. Test repaired items to ensure satisfactory operation.

END OF SECTION 26 95 00

SECTION 31 23 00 - EXCAVATION AND FILL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Preparing and grading subgrades for slabs-on-grade, walks, pavements, and landscaping.
2. Excavating and backfilling for structures.
3. Drainage and moisture-control fill course for slabs-on-grade.
4. Subbase course for walks and pavements
5. Subsurface drainage backfill for walls and trenches
6. Excavating and backfilling trenches within building lines
7. Excavating and backfilling for underground utilities and appurtenances.

1.2 DEFINITIONS

A. Excavation consists of the removal of material encountered to subgrade elevations and, where applicable, the reuse or disposal of materials removed.

B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below Subbase, drainage fill, or topsoil materials.

C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

D. Subbase Course: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk.

E. Base Course: The layer placed between the Subbase and surface pavement in a paving system.

F. Fill: Soil materials used to raise existing grades.

G. Pipe Bedding: Layer placed over the excavated subgrade in a trench before laying pipe.

H. Unauthorized excavation consists of removing materials beyond indicated lines and grades. Unauthorized excavation, as well as remedial work related to unauthorized excavation shall be at the Contractor's expense.

I. Structures: Slabs, curbs, electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

J. Utilities include on-site underground pipes, conduits, ducts, cables, as well as underground services.

K. ODOT, Construction and Materials Specifications of the State of Ohio.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Test Reports: In addition to test reports required under field quality control, submit reports from a qualified testing laboratory and interpreting test results for specification compliance.

1. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources. Classify soils in accordance with ASTM D2487 and ODOT Soil Classification Chart, which is in general agreement with ASTM D3282 “Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes”.
2. Laboratory compaction curves in accordance with ASTM D698, Method C for each on-site or borrow soil proposed for fill and backfill.
3. Material certifications

C. For proof-rolling equipment, provide charts or tabulations verifying the contact areas and pressures over the full range of inflation pressures and over the full range of loading conditions.

D. Excavation Plan: Prior to start of excavation operations, submit written plan to demonstrate compliance with OSHA Standard 29 CFR Part 1926 Subpart P - Excavations.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

B. Testing and Inspection Service: The Contractor shall employ an independent testing agency qualified to classify proposed on-site and borrow soils to verify that soils comply with specified requirements, and to perform required field and laboratory testing required for submittals.

C. The Contractor shall have a competent representative onsite at all times during the Work to monitor compliance with OSHA trenching and excavation regulations. The representative shall be capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees. The representative shall have authorization to take prompt and corrective measures to eliminate such hazards or working conditions.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the others except where permitted in writing by the Owner and then only after acceptable temporary utility services have been provided.

1. Provide a minimum 48-hour notice to the Owner and receive written notice to proceed before interrupting any utility.

1.6 REGULATORY REQUIREMENTS

A. Permits and Regulations:

1. Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.

B. Imported Borrow Materials: Unless otherwise shown or specified, imported borrow materials shall be natural soil or natural granular materials free of rock, gravel, or soil masses larger than 2 inches in any dimension, topsoil, debris, waste, frozen materials, grass, roots, vegetation, brick, steel, and other deleterious matter. Soil materials shall be capable of specified compaction requirements. Materials to be placed within 6-inches of any structure or pipe shall be free of rocks and unbroken soil masses having a maximum dimension of 2-inches. On-site soil materials meeting this specification will be acceptable materials. Soils shall meet all of the following criteria.

1. Soils shall have a liquid limit no greater than 65.
2. Soils shall comply with the restrictions of ODOT Item 203.03.
3. The following materials as defined under ODOT Item 203.02 shall not be used as fill, backfill, or embankment materials:

a. Reclaimed asphalt concrete pavement (RACP} per Item 203.02A.
b. Petroleum contaminated soil (PCS} per Item 203.02K
c. Recycled Portland Cement Concrete per Item 203.02M
d. Recycled Materials per Item 203.02N.
e. Slag materials per Item 203.02Q

C. Aggregate Base Material, Aggregate Fill, and Select Fill: Crushed carbonate stone or crushed gravels meeting the requirements of ODOT Item 304 with the following exception: No imported slag or recycled concrete materials shall be permitted.

D. Stone/Granular Fill/Drainage Fill: ODOT Item 703, No. 57 or 67. (Crushed limestone only; no slag permitted.)

E. Pipe Bedding, Cover and Embedment: Course interlocking aggregate conforming to ODOT Item 703.01 (AASHTO M43} No. 57. Aggregate shall be crushed carbonate stone or crushed gravel. No slag or recycled concrete materials shall be permitted.

F. Fill, Backfill, and Embankment Materials: Unless otherwise shown or specified, fill, backfill, and embankment materials shall be existing excavated soils free of debris larger than 6-inches in any dimension, frozen materials, grass, roots, vegetation, and other large debris fragments. Onsite fill soils with moderate amounts of glass fragments, slag, bricks, concrete fragments, or asphalt fragments will be allowed as backfill. Fill materials shall be capable of specified compaction requirements.

G. Low Strength Mortar (LSM} Backfill:

1. Flowable and pumpable fill conforming to the requirements of ODOT Item 613, Type 1 or Type 2.

H. Temporary Fence:

1. Posts:

a. End and Corner Posts: 2-inch diameter, galvanized steel; maximum distance to adjacent posts shall be 6 feet.
b. Cross Bracing: 1-inch diameter, galvanized steel: placed at all ends and corners.
c. Intermediate Posts: Steel; U, Y, T or channel sections; maximum spacing between intermediate posts shall be 10 feet.
d. All posts shall be driven into the ground a minimum of 3 feet.

2. Wire: Provide #9 galvanized wire, top and bottom. Anchor to posts and draw to 150 pounds tension.
3. Fence Fabric: Provide 48-inch high safety-orange, polyethylene construction. Attach fence fabric to top and bottom wire and posts with 1/4-inch wide polyethylene self-locking ties at 24 inches center to center.

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 earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Allow no rock, boulders, cobbles, or unyielding debris to project within 6 inches of pipe or structure.

E. Where pipe is to terminate into a structure, place and compact backfill for the deeper structure to a minimum elevation of 1 foot above top of pipe prior to excavating trench and placing pipe.

F. Place barricades and warning lights around any open excavations occurring as part of this Work. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

G. Furnish, install, maintain, and subsequently remove temporary fences surrounding all excavations and all other Work areas required by this Project. All temporary fencing, in addition to meeting these requirements, shall meet all requirements of OSHA.

3.2 DEWATERING AND DRAINAGE

A. Dewatering system as specified in Section 31 23 19 Dewatering.

B. The Contractor has full responsibility for maintaining the site in a dewatered condition throughout the construction period.

1. Prevent surface and subsurface water from flowing into excavations and from flooding adjacent areas.
2. Remove water from excavation as fast as it collects.
3. Use well points, cofferdams, or other acceptable methods to permit construction under dry conditions.
4. Maintain dry conditions until fresh concrete has reached sufficient strength to withstand earth and hydrostatic loads.

3.3 EXCAVATION

A. Explosives: Do not use explosives.

B. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

C. Controlling Water: Maintain excavation in dry condition.

1. If pumping is required, pump excavations in such a manner to prevent the carrying away of unsolidified concrete materials, and to prevent damage to the existing subgrade. Avoid pumping of fine grain particles from the in place soils.

3.4 STABILITY OF EXCAVATIONS

A. Comply with all Federal and State Occupational Safety and Health Administration (OSHA) regulations. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

B. Excavation support systems as specified in Section 31 50 00 Excavation Support and Protection.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing precast or prefabricated structures, placing and removing concrete formwork, installing services and other construction, and for inspection.

B. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave a solid base for other work.

3.6 EXCAVATION FOR WALKS, GRAVEL DRIVES AND PAVEMENTS

A. Excavate surfaces under walks, gravel drives and pavements to the indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR TRENCHES

A. Excavate trenches in a manner to minimize loss of soil into the excavation, to minimize soil movement outside the excavation, to maintain stability of the excavation, and to preserve the existing strength of soils surrounding the excavation.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated. Sidesloping or "benching down" of the trench will not be permitted where the trench is excavated within a permanent pavement, or where such sidesloping or benching would endanger existing underground utilities or structures. Confine trench widths to dedicated rights-of-way or construction easements.

C. Provide a trench width sufficient, but no greater than necessary, to ensure working room to properly and safely place and compact backfill within the pipe zone. The space between the pipe and trench wall shall be wider that the compaction equipment used in the pipe zone.

D. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.

1. For pipes or conduits less than 6-inches in nominal diameter and flat- bottomed, multiple-duct conduit units, hand excavated trench bottoms and support pipe on an undisturbed subgrade.
2. For pipe 6-inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped pipe backfill.

E. As the excavation progresses make frequent observations for cracking and subsidence of ground near the excavation, excessive deflection or failure of support system elements and connections, and other indications of distress.

F. In the event that excavation threatens to endanger personnel, the work, or adjacent property, cease excavation. Evaluate methods of construction and revise as necessary to ensure the safe continuation of the work.

G. Methods of trench excavation shall accommodate the installation of trench support systems in conformance with OSHA requirements; and shall accommodate the removal of pavement, rubble, building debris, abandoned pipe, and boulders.

H. Allow no rock, boulders, cobbles, or unyielding debris to project within 6 inches of pipe or structure.

I. Where pipe is to terminate into a structure, place and compact backfill for the deeper structure to a minimum elevation of 1 foot above top of pipe prior to excavating trench and placing pipe.

J. J. The length of open trench permitted in any location shall not exceed the amount of pipe to be installed that day. Backfill trenches completely at the end of each day. Alternatively, cover trenches with road plates.

3.8 TRENCH AND EXCAVATION SUPPORT SYSTEMS

A. If a trench box is used during backfill operations, it shall be lifted to a location above each layer of backfill material prior to compacting the layer. Do not advance the trench box in a manner that would pull the already joined pipe apart or leave voids around the pipe.

B. Modify ground support systems as necessary during the course of the work to suit soil and groundwater conditions encountered.

C. Removal of sheeting from below the top of the pipe zone after backfill in the pipe zone has been compacted is prohibited, unless otherwise approved by the Engineer. If the Engineer permits such removal, fill voids lefts on removal of sheeting and compact backfill material to required densities.

D. Restrictions on removal of sheeting also apply at manholes and other concrete structures.

E. The Contractor may, at his expense, and with the written approval of the Engineer, leave sheeting in place provided that the top 5 feet below the final street or surface grade is removed. Provide additional clearance as necessary for new or relocated utility lines or other structures.

3.9 SUBGRADE PREPARATION

A. After pavement subgrade has been compacted in accordance with these specifications, the subgrade shall be proof-rolled in accordance with ODOT Item 204.06. The proof-rolling should be observed by an on-site Geotechnical Engineer or a Soils Technician working under the Engineer's supervision. If very-soft to soft, very-loose, weak, or unstable areas are present, these unsuitable subgrades should either be; 1) remediated in place by scarifying, aerating (drying), and re-compacting; 2) removed and the resulting undercut excavations filled in a controlled manner with approved, properly compacted backfill; or, 3) improved in-place by other suitable methods as directed by the on-site Geotechnical Engineer. Such other methods could include working large (#1 and #2) stone into the yielding subgrades, use of lime or cement modification, or by partial undercutting and replacement with a system of Geogrid or a separating fabric overlain by a suitable thickness of stone needed to achieve subgrade stability. The Contractor is responsible for correcting all substandard materials or workmanship.

1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Engineer.

3.10 UNAUTHORIZED EXCAVATION

A. Limits: Unauthorized excavation is defined as all excavation outside the lines and grades shown.

B. Responsibility: All unauthorized excavation, together with the removal and disposal of the associated material, is at the Contractor's expense.

C. Backfill: Fill and compact the unauthorized excavation with select fill at the Contractor's expense.

3.11 STORAGE OF SOIL MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill soil materials, including borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip lines of remaining trees.

3.12 BACKFILL

A. Backfill excavations promptly, but not before completing the following:

1. Acceptance of construction below finished grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for record documents
3. Testing, inspecting, and approval of underground utilities
4. Concrete formwork removal
5. Removal of trash and debris from excavation
6. Removal of temporary shoring and bracing and sheeting
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.13 BACKFILL OF STRUCTURES

A. Unless otherwise shown or noted, backfill around structures shall be as follows:

1. Under pavements, walks and gravel drives: use select fill. Under lawn and porous paver areas: use backfill materials

B. Backfill shall not be placed, nor excavation support systems removed, until internal supporting walls of structures have been completed.

C. Remove all form materials and trash from the excavation before placing any backfill. Remove loose, sloughing, or caving soil from bottoms and sidewalls of excavation.

D. Backfill around structures only after the concrete has attained 2/3 of the specified compressive strength. Obtain the Engineer's approval of concrete work and attained strength prior to backfilling.

E. Raise backfill uniformly around structures to prevent unbalanced lateral loading. Place backfill in such a manner that any water in the excavation will be displaced by backfill and not trapped therein.

F. Do not operate earth-moving equipment within 5 feet of walls of structures for the purpose of depositing or compacting backfill materials.

G. Where compacting granular backfill adjacent to walls, use hand-operated tampers or other equipment that will not damage the structure.

H. Low Strength Mortar Backfill:

1. Use LSM for backfilling where indicated by the drawings.
2. The LSM shall be placed in accordance with the requirements of ODOT Item 613.

3.14 TRENCH BACKFILL

A. Immediately prior to placing pipe bedding, remove loose, sloughing, or caving soil from the bottom and sidewalls of the excavation.

B. Place pipe bedding material for the full width of the trench and to proper grade and elevation, and compact to provide a firm, uniform support for the pipe. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Compact bedding to specified requirements.

C. Place pipe bedding material for a minimum of 6 inches below the pipe and for the full width of the trench to proper grade and elevation, and compact to provide a firm, uniform support for the pipe. Compact bedding to a minimum of 100 percent maximum density as determined by ASTM D 698.

D. Position the pipe to correct line and grade. Excavate bell holes in the bedding to ensure that the pipe is lying flat on the trench bottom and is supported by the full length of the pipe barrel. Fill any voids under the bell or pipe by working in bedding material.

E. Place pipe bedding material in loose lifts not to exceed 6 inches, and compact around the pipe to the height shown on the Drawings. Compact a minimum of 100 percent maximum density as determined by ASTM D 698. Do not allow compaction equipment to contact and damage the pipe.

F. Backfill above pipe bedding material with pipe cover material. Place in loose lifts not to exceed 6 inches and compact to a height of 12 inches above the pipe barrel. Compact a minimum of 100 percent maximum density as determined by ASTM D 698.

G. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.

H. Place and compact final backfill of satisfactory soil material to final subgrade.

I. Backfill trenches above the pipe zone with backfill or LSM, as shown on the drawings.

J. Do not permit backfill to free-fall onto a pipe with less than 2 feet of cover over the top of the pipe. Do not allow backfill to drop with a force capable of damaging or displacing the pipe. Place backfill in a manner that avoids segregation. Stop backfill at the necessary grade to provide for the placement of subgrade, surface course, or topsoil as required.

K. Where trenching operations expose existing pipelines and telephone or electrical conduits, replace any bedding in a manner to restore the original grade and level of support of the pipe or

conduit. Complete the trench backfill above the existing pipeline or conduit with the backfill shown or specified, or as directed by the Engineer.

L. Comply with Pipe Trench Details shown on the Drawings.

3.15 FILL

A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.

1. Plow, strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.
2. Where the existing ground surfaces have slopes equal to or greater than 1 vertical to 8 horizontal, place benches into the existing slope prior to placing fill.

B. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture- condition or aerate soil and recompact to required density.

C. Place fill materials in layers to required elevations for each location listed below.

1. Under grass, use satisfactory excavated or borrow soil material.
2. Under walks, gravel drives and pavements, use select fill.
3. Under steps and ramps, use select fill.
4. Under footings and foundations, use select fill.

3.16 MOISTURE CONTROL

A. Before or during compaction, allow the embankment material that contains excess moisture to dry to a moisture content needed to meet the density requirements. Continue drying until the required moisture is uniform throughout the lift. However, for material that displays pronounced elasticity or deformation under the action of loaded rubber tire construction equipment or other equipment, reduce the moisture content to secure stability. Expedite and manipulate the embankment material by drying the wet embankment material by using plows or discs; by adding dry material, lime, lime kiln dust, or cement; or by other methods.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.

a. Stockpile or spread and dry removed wet unsatisfactory soil material.

3.17 COMPACTION

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy construction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure.

C. Percent of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D698.

1. Under structures, building slabs, steps, and pavements, compact the top 12 inches below subgrade and each layer of backfill or fill material to 100 percent maximum dry density.
2. Under walkways and gravel drives, compact the top 6 inches below subgrade and each layer of backfill or fill material to at least 98 percent maximum dry density.

3.18 GRADING

A. Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of backfill or fill material to at least 95 percent maximum dry density.

B. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated

1. Provide a smooth transition between existing adjacent grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

C. Site Grading: Slope grades to direct water away from and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Area: Plus or minus 1 inch
2. Walk and Gravel Drives: Plus or minus 1 inch
3. Pavements: Plus or minus 1 inch when tested with a straight edge applied parallel to the centerline.

D. Pipes shall be laid to within one-half inch of grade (measured at invert) and to within one inch of line.

3.19 BASE COURSES

A. Place base course material over subbases to pavement.

1. Compact base course per requirements.
2. Shape base to required crown elevations and cross-slope grades.
3. When thickness of compacted base course is 6 inches or less, place materials in a single layer.
4. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.20 DISPOSAL OF EXCAVATED MATERIALS

A. At no additional cost to the Owner, haul away from the Project Site all material removed from the excavations that does not conform to the requirements for fill or is otherwise in excess of that required for the project.

B. Dispose of unsatisfactory or excess materials in compliance with municipal, county, state, federal or other applicable regulations at no additional cost to the Owner.

3.21 REPAIR/RESTORATION

A. Restoring and Resurfacing Existing Roadways and Facilities:

1. Place 1-1/2 inches of temporary bituminous pavement immediately after backfilling trenches in paved roadways that are to be retained for permanent use.

a. In areas of roadway where LSM backfill is used, the LSM may be used as temporary pavement.

2. Maintain the surface of the paved area over the trench in good and safe condition during progress of the entire Work, and promptly fill all depressions over and adjacent to the trench caused by settlement of backfilling.
3. The permanent replacement pavement shall be equal to that of the existing roadways unless otherwise specified.

B. Disturbed Areas:

1. Restore all pavement, gutters, curbs, sidewalks, or roadways disturbed or damaged by the Contractor's operations, except areas designated "New Pavement" or "Proposed Pavement."
2. Repair damage and restore disturbed areas to conditions present before commencement of the Work.
3. Refer to Section 32 91 19 Seeding.

3.22 GRANULAR FILL PLACEMENT UNDER INTERIOR BUILDING SLABS

A. Place Granular Fill over subgrade under interior concrete building slabs to thicknesses indicated on the drawings.

B. Level Granular Fill to receive concrete slab construction as detailed.

3.23 FIELD QUALITY CONTROL

A. Testing Agency Services: As required in Section 01 41 00 Testing Laboratory Services, testing shall be performed by an independent testing agency approved by the Owner and paid by the Contractor. Allow the testing agency to inspect and test each subgrade and each fill, backfill, or base layer. Do not proceed until test results for previously completed work verify compliance with requirements.

1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.

    a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 6938, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 6938.
    b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.

2. Footing Subgrade: At footing subgrades, perform at least one test per 25 feet length of footing of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Engineer.
3. Paved, Gravel Drive and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2000 sq. ft. or less of paved area, gravel drive or building slab, but in no case fewer than three tests.
4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests per trench.

B. When testing agency reports that subgrades, fills, backfills, or bases are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

3.24 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions

1. Scarify or remove and replace material to depth directed by the Architect; reshape and recompact at optimum moisture content to the required density.

C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.25 SETTLEMENT

A. Any subsequent damage to slabs, piping, utilities, or structures caused by settlement of fill material occurring within the 1-year guarantee period addressed in the General Conditions will be considered to be caused by improper compaction and shall be corrected by the Contractor at no additional cost to the Owner. Restore any structures damaged by settlement to the condition that existed prior to the commencement of the work.

END OF SECTION 31 23 00

SECTION 32 12 16 - ASPHALT PAVING

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. Hot-mix asphalt patching.
2. Hot-mix asphalt paving.
3. Asphalt surface treatments.

B. Related Requirements:

1. Section 02 41 19 "Selective Demolition" for demolition and removal of existing asphalt pavement.
2. Section 31 20 00 "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include technical data and tested physical and performance properties.
2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
3. Job-Mix Designs: For each job mix proposed for the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

B. Material Test Reports: For each paving material, by a qualified testing agency.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Ohio DOT for asphalt paving work.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
3. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
4. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242/D 242M or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320, PG 64-22.

B. Asphalt Cement: ASTM D 946/D 946M for penetration-graded material.

C. Cutback Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70.

D. Emulsified Asphalt Prime Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Tack Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

F. Fog Seal: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

G. Water: Potable.

H. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires, asphalt shingles, or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

C. Sand: ASTM D 1073 or AASHTO M 29, Grade No. 2 or No. 3.

D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

E. Joint Sealant: ASTM D 6690 or AASHTO M 324, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

A. Recycled Content of Hot-Mix Asphalt: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent or more than 15 percent by weight.

1. Surface Course Limit: Recycled content no more than 10 percent by weight.

B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: ODOT 301.
3. Surface Course: ODOT 448, Type 1, PG 64-22.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. 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.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by the Owner's Representative, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.4 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent or greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

C. Asphalt Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch (3 mm) of height indicated above pavement surface.

3.9 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Contractor to engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. Asphalt Traffic-Calming Devices: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.

E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Replace and compact hot-mix asphalt where core tests were taken.

G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.11 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan.

END OF SECTION 32 12 16

SECTION 32 13 13 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Walkways.
2. Barrier Curbs
3. Concrete Pavement

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete pavement mixture.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

D. Plain Steel Wire: ASTM A 82, as drawn.

E. Deformed-Steel Wire: ASTM A 496.

. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

2.2 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I or II.

a. Fly Ash: ASTM C 618, Class C or F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 4M coarse aggregate, uniformly graded. Provide aggregates from a single source.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: ASTM C 494/C 494M, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

2.3 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.4 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. 1. Prior to pouring concrete, follow the manufacturer's instructions for installation and cap expansion joint strip with Vinylex Removable Cap Strip (Vinylex Corporation, Knoxville, TN, (423) 690-2211 or approved equal. Remove cap strip after concrete cures and caulk joint.

2.5 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.

4. Air Content: 6 percent plus or minus 1.5 percent.

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement 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. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed pavement surfaces with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water 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.

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. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these methods.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.9 PAVEMENT MARKING

A. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

B. Sweep and clean surface to eliminate loose material and dust.

C. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 91 19 - SEEDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Preparation of topsoil.

B. Fertilizing, seeding, mulching, and watering.

C. Maintenance.

1.3 PROJECT CONDITIONS

A. Seeding is required for all earth areas disturbed by CONTRACTOR's operations.

B. Determination of seed mix A, B, and C areas will be by ENGINEER.

C. Provide steep embankment seed mixture and erosion control blanket on slopes 3:1 or greater unless otherwise directed by ENGINEER.

D. Accomplish seeding by the hand application method or by the hydroseeding method:

1. Hand Application Method: Follow all requirements of this Section, except Article 3.7.
2. Hydroseeding Method: Follow all requirements of this Section, including Article 3.7.

1.4 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.5 REGULATORY REQUIREMENTS

A. Obtain fertilizer from a dealer or manufacturer whose brands and grades are registered or licensed by the State of Ohio, Department of Agriculture.

B. Seeds to be approved by State of Ohio, Department of Agriculture, Division of Plant Industry.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Deliver grass seed in separate varieties, separately packaged or bagged, with labels or tags in accordance with ORC 907.03. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer in water-proof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 - PRODUCTS

2.1 SEED MIXTURE

A. Seed Mix A: Turf Areas:

1. Kentucky Bluegrass (Poa Pratensis): 40percent.
2. Creeping Red Fescue Grass (Festuca Rubra): 40percent.
3. Perennial Ryegrass (Lolium Perenne): 20percent.

B. Seed Mix B: Slope Stabilization Mix Per MWCD Standards (200 oz per acre):

1. Big Blue Stem (Andropogon Geradii): 24 percent
2. Side Oats Grama (Bouteloua Curtipendula): 8 Percent.
3. Prairie Sedge Mix (Carex Spp.): 2 percent.
4. Canada Wild Rye (Elymus Canadensis): 16 percent
5. Virginia Wild Rye (Elymus Virginicus): 12 percent
6. Switch Grass (Panicum Virgatum): 6 percent
7. Little Blue Stem (Schizachyrium Scoparium): 16 percent
8. Indian Grass (Sorghastrum Nutans): 16 percent

C. Seed Mix B: Temporary Cover (752 oz per acre):

1. Common Oat (Avena Sativa): 68 percent.
2. Annual Rye (Lolium Multiflorum): 32 percent.

D. Seed Mix C: Riparian Buffer (80 oz per acre):

1. Side Oats Grama (Bouteloua Curtipendula): 12.5 percent
2. Prairie Sedge Mix (Carex Spp): 5 percent
3. Canada Wild Rye (Elymus Canadensis): 40 percent
4. June Grass (Koeleria Cristata): 1.25 percent
5. Switch Grass (Panicum Virgatum) 1.25 percent
6. Little Blue Stem (Schizachyrium Scoparium): 40 percent

E. Cover Crop for Seed Mix C (460 oz per acre):

1. Common Oat (Avena Sativa): 78 percent
2. Annual Rye (Lolium Multiflorum): 22 percent

F. Forbs for Seed Mix C (51.25 oz per acre):

1. Thimble Weed (Anemone Cylindrica): 1 percent

2. Butterfly Milkweed (Asclepias Tuberosa): 4 percent
3. Heath Aster (Aster Ericoides): 0.5 percent
4. Smooth Blue Aster (Aster Laevis): 1.5 percent
5. New England Aster (Aster Novee-Angliae): 0.5 percent
6. Partridge Pea (Chamaecrista Fasculata): 27 percent
7. Sand Coreopsis (Coreopsis Lancoelata): 10 percent
8. Prairie Coreopsis (Coreopsis Palmate) : 2 percent
9. White Prairie Clover (Dalea Candida): 3 percent
10. Purple Prairie Clover (Dalea Purpurea): 3 percent
11. Purple Coneflower (Echinacea Purpurea): 14 percent
12. Round-Head Bush Clover (Lespedeza Capitata): 4 percent
13. Rough Blazing Star (Liatris Aspera): 1 percent
14. Wild Bergamot (Monarda Fistulosa): 1.5 percent
15. Foxglove Beard Tongue (Penstemon Digitalis): 1 percent
16. Common Mountain Mint (Pycnanthermum Virginianum): 2 percent
17. Yellow Coneflower (Ratibida Pinnata): 8 percent
18. Black Eyed Susan (Rudbeckia Hirta): 10 percent
19. Prairie Dock (Silphium Terebinthinaceum): 1 percent
20. Old Field Goldenrod (Solidago Nemoralis): 1 percent
21. Common Spiderwort (Tradescantia Ohienisis): 1.5 percent
22. Common Ironweed (Vernonia Fasciculate): 3 percent
23. Culvers Root (Veronicastrum Virginianum): 0.5 percent

2.2 MULCHING MATERIALS

A. For all areas, except on slopes 3:1 or greater, provide oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry; anchor in place.

1. Mulch Anchoring: Fiber mulch or commercially available synthetic binder (non-asphaltic).

B. For slopes 3:1 or greater, provide erosion control blankets.

1. Manufacturers: PPS Packaging Company, XCEL Superior Erosion Control Blanket, or as approved.
2. Description: Machine-produced mat of wood excelsior fibers, 80 percent of which are 6 inches or longer in length with a consistent width of fibers evenly distributed throughout the blanket, with a photo-degradable, extruded plastic netting covering the top and bottom of each blanket.
3. Weight: 1.0 pounds per square yard.
4. Accessories: 8 inch by 1 inch by 8 inch, 9 gage staples.

C. Wood cellulose fiber specifically prepared for hydroseeding.

2.3 FERTILIZER

A. Liquid or dry; recommended for grass, with 50 percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the following proportions: Nitrogen 12 percent, phosphoric acid 12 percent, soluble potash 12 percent.

2.4 WATER

A. Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that prepared soil base is ready to receive Work of this Section.

3.2 PREPARATION OF TOPSOIL

A. Prepare topsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots, clods, lumps, boulders, and stones, larger than $1^1/_2$" in any dimension.

C. Scarify topsoil to a depth of 2 inches. Repeat cultivation in areas where equipment used for hauling has compacted topsoil.

3.3 FERTILIZING

A. Apply fertilizer at a rate of 20 pounds per 1,000 square feet.

B. Apply after smooth raking of topsoil.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.4 SEEDING

A. Mix seed varieties in the presence of a representative of OWNER or ENGINEER.

B. Apply seed at a rate of 5 pounds per 1,000 square feet for residential and urban and non-urban mixtures, and 4 pounds per 1,000 square feet for steep embankment mixture. Apply evenly in two intersecting directions. Rake in lightly to cover seed to a depth of 1/4 inch.

C. Do not seed areas in excess of that which can be mulched on same day.

D. Do not sow immediately following rain, when ground is too dry, frozen or during windy periods.

3.5 MULCHING

A. Apply mulching materials immediately following seeding.

B. For all areas, except on slopes 3:1 or greater, apply mulch at a rate of 2 tons per acre for straw when seeding between March 15 and October 15, and at a rate of 3 tons per acre for straw when seeding between October 15 and March 15. Anchor mulch in place. Maintain clear of shrubs and trees.

C. For slopes 3:1 or greater, roll erosion control blankets down slope vertically, making sure excelsior is in contact with soil; fasten with staples 2 feet horizontally and 3 feet vertically.

3.6 WATERING

A. After each area has been mulched, apply water with a fine spray at a rate of 120 gallons per 1,000 square feet.

3.7 HYDROSEEDING

A. Equipment: Hydraulic mulcher with hose and nozzle attachment.

B. Tank mix seed, fertilizer and mulch to required slurry consistency.

C. Application Rate per 1,000 Square Feet:

1. Seed: 6 pounds.
2. Fertilizer: Quantity required to yield 1 pound nitrogen.
3. Mulch: 46 pounds.

D. When applying materials, direct nozzle at the soil in a way to achieve maximum mixing of soil and seed.

E. Protect all non-turf areas.

F. Clean hydroseed mixture off all non-turf areas within 24 hours of application.

3.8 MAINTENANCE

A. Protect and care for seeded areas until grass is a well established, uniform growth at least 4 inches high.

B. Water to prevent grass and soil from drying out.

C. Once established, remove excess mulch and mow grass to a height not less than 1-1/2 inches nor greater than 2-1/2 inches.

D. Control growth of weeds.

E. Maintain grass for 2 weeks after initial mowing.

F. Reseed areas that do not show a prompt catch at intervals of 21 days until a uniform growth is established.

G. Reseed areas damaged due to acts of neglect by residents or vandalism only at the request and expense of OWNER.

END OF SECTION 32 91 19