PROJECT MANUAL

AL RITT STADIUM - IMPROVEMENTS
2521 Baker Street
Dexter, MI 48130

DEXTER HIGH SCHOOL – ATHLETIC IMPROVEMENTS
2200 N. Parker Road
Dexter, MI 48130

OWNER:

DEXTER COMMUNITY SCHOOLS
2704 Baker Road
Dexter, MI 48130

TMP PROJECT NO.: 25024C, 25026C

DATE: March 3, 2026

ISSUED FOR: D.R.1 CONSTRUCTION DOCUMENTS

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Al Ritt Stadium Improvements, Dexter High School Athletic Improvements

25024C, 25026C

This Document has been prepared under the supervision of the Architect and/or Professional Engineer as indicated by their individual License Seals affixed hereon.

Professional License Seals

Seal	Seal	Seal
TMP Architecture, Inc. *Architect*	***William A. Kibbe Associates, Inc.*** *Structural Engineer*	***Peter Basso Associates, Inc.*** *Mechanical Engineer*

Seal	Seal
Peter Basso Associates, Inc. *Electrical Engineer*	***Beckett & Raeder Inc.*** *Civil & Landscape Engineer*

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APPENDIX 1

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LIST OF DRAWINGS

1.01 GENERAL

A. Drawings: Drawings consist of the Contract Drawings including drawings listed on the TITLE SHEET page of the separately bound drawing set titled Dexter Al Ritt Stadium Improvements and Dexter High School Outdoor Athletic Improvements, dated March 3, 2026 and any subsequent Addenda and Contract modifications which may occur.

END OF SECTION 00 0115

SECTION 00 3100 - AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 SUMMARY

A. Project Manual uses Appendixes to organize information that does not conform to 3-part specification formatting as defined by the Construction Specifications Institute (CSI).

1. Appendix information does not have a six-digit number or title as defined by CSI's MasterFormat.

1.02 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders as Information Available to Bidders, but will not be part of Contract Documents, as follows:

1. Geotechnical Report: Entitled 2025 Dexter Schools Bond Program, dated October 13, 2025.
   a. Copy is attached to Project Manual in Appendix 1.
2. Geotechnical Report: Entitled DHS Fieldhouse and Site Improvements and Al Ritt Stadium Lighting, Dated December 29, 2025.
   a. Copy is attached to Project Manual in Appendix 1

1.03 MISCELLANEOUS INFORMATION

A. Miscellaneous information relating to the project is available in the Appendixes as follows:

1. Includes information issued as an Appendix by Addendum or other subsequent Contract modification.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION -- NOT USED

END OF SECTION 00 3100

SECTION 00 8200.01 - TMP ELECTRONIC FILE RELEASE FORM

.

RE: AUTHORIZATION FORM FOR CAD FILE TRANSFERS
PROJECT NAME: _____
TMP PROJECT NO. : _____ BID PACK NO._____

DEAR SIR/MADAM:

A. Per your request, TMP Architecture, Inc. will electronically transmit requested CAD files upon receipt of an original signed copy of this form which states the conditions of agreement and the receipt of the required compensation fee.
B. By acceptance it is understood and agreed that the data and medium being supplied is to be used only for the project referenced.
C. It is further understood and agreed that the undersigned will hold TMP Architecture, Inc. and its Consultants harmless and indemnify TMP Architecture, Inc. and its Consultants from all claims, liabilities, losses, and so forth, including attorney's fees arising out of the use or misuse of the transferred files.
D. It is understood and agreed that the items transmitted are prepared from CAD files current at the time of preparation. All files are [AutoCAD version 2018 dwg files].
E. This information does not waive the need to verify and review current field conditions and the status of Addenda and/or Bulletin documentation.
F. As a record of information to be transmitted, TMP Architecture, Inc. will prepare a duplicate electronic back-up for its record.
G. Compensation for providing this material will be as follows:
    1. Base Fee of [$250] for 1 to 3 Drawings.
    2. Base Fee of [$500] for 4 to 10 Drawings.
H. For each additional Drawing after 10 the fee is [$40] per Drawing.
I. Example: [11 drawings = $540].
J. Payment must be provided along with a signed copy of this form before files will be released. Please remit to [Construction Manager] to be forwarded to the Project Manager at TMP Architecture, Inc. and allow five working days for processing.

FEE: $_____
REQUESTED DRAWINGS: _____
_____
_____

FIRM REQUESTING FILES:

Company: _____
Address: _____
Signed:_____Date: _____
Printed Name / Title: _____
Email: _____

TO BE COMPLETED BY TMP ARCHITECTURE, INC.

Released(signed by): _____TMP Architecture, Inc.
Printed Name/Title:_____ Date: _____

END OF SECTION 00 8200.01

SECTION 00 8200 - AVAILABILITY OF ELECTRONIC FILES

AVAILABILITY OF ELECTRONIC FILES

1.01 POLICY

A. As a service to Contractor, subcontractors, vendors, material suppliers and others needing electronic copies of Drawings, the Architect will provide CAD files electronically in accordance with the following policy:

1. By acceptance it is understood and agreed that the data and medium being supplied is to be used only for the project referenced.
2. It is further understood and agreed that the undersigned will hold TMP Architecture, Inc. and its Consultants harmless and indemnify TMP Architecture, Inc. and its Consultants from all claims, liabilities, losses, and so forth, including attorney's fees arising out of the use or misuse of the transferred files.
3. It is understood and agreed that the files transmitted are prepared from CAD files current at the time of preparation. All files are AutoCAD version 2018 dwg files.
4. This information does not waive the need to verify and review current field conditions and the status of Addenda and/or Bulletin documentation.
5. As a record of information to be transmitted, TMP Architecture, Inc. will prepare a duplicate electronic back-up for its record.
6. Compensation Fee for providing this material will be as follows:
   a. Base Fee of $250 for 1 to 3 Drawings.
   b. Base Fee of $500 for 4 to 10 Drawings.
   c. For each additional Drawing after 10, the fee is $40 per Drawing.
      1) Example: 11 Drawings = $540.
7. A signed copy of the Release Form and Fee must be provided before files will be released.

1.02 REQUEST PROCEDURE

A. To receive Drawing CAD files the Release Form must be completed in full and submitted to the Construction Manager to be forwarded to the Project Manager at TMP Architecture, Inc.

1. A signed copy of the Release Form must be submitted.
   a. Faxed or emailed copies will be accepted.
2. Upon remittance of the signed Release Form and Fee, allow five working days for processing.
3. Transmission of Drawings will be provided electronically after the receipt of Fee.

1.03 RELEASE FORM

A. Release Form is located immediately after this Section. Refer to Section 00 8200.01 Electronic Files Release Form.

END OF SECTION 00 8200

SECTION 01 0005 - RELATED REQUIREMENTS

PART 1 GENERAL

1.01 DIVISION 00 AND DIVISION 01

A. Unless otherwise noted, all provisions of sections and documents in Division 00 and Division 01, including, but not limited to, General Conditions and Supplementary Conditions, relate and apply to all sections and documents within Project Manual; including, but not limited to, sections and documents in Division 00 through Division 48.

1.02 DRAWINGS

A. Unless otherwise noted, Drawings relate and apply to all specification sections and documents within Project Manual; including, but not limited to, sections and documents in Division 00 through Division 48.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION -- NOT USED

END OF SECTION 01 0005

SECTION 01 2500.01 - TMP SUBSTITUTION REQUEST FORM

SUBSTITUTION REQUEST NUMBER: _____ DATE SUBMITTED: _____
TMP PROJECT NUMBER 25024C, 25026C PROJECT NAME: AL RITT STADIUM IMPROVEMENTS AND DEXTER HIGH SCHOOL OUTDOOR ATHLETICS

SPECIFIED ITEM

SPECIFICATION TITLE:_____
SPECIFICATION SECTION_____SPECIFICATION ARTICLE/PARAGRAPH: _____
SPECIFIED PRODUCT / DESCRIPTION: _____
SPECIFIED MANUFACTURER: _____
SPECIFIED PRODUCT / MODEL: _____
REASON SPECIFIED ITEM CANNOT BE PROVIDED: _____
_____
_____

PROPOSED SUBSTITUTION

DESCRIPTION OF PROPOSED SUBSTITUTION: _____
_____
PROPOSED MANUFACTURER: _____
ADDRESS: _____
WEBSITE: _____
PRODUCT / MODEL: _____
YEARS PRODUCT/MODEL HAS BEEN MANUFACTURED: _____
DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED ITEM: _____
_____
_____
_____
_____
WILL PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK? ☐ NO ☐ YES
IF YES, EXPLAIN HOW: _____
_____
_____
_____
HOW WILL SUBSTITUTION BENEFIT THE OWNER: ☐ COST SAVINGS ☐ TIME SAVINGS ☐ OTHER
PROVIDE SPECIFIC DETAILS: _____
_____
_____
_____

THE FOLLOWING INFORMATION IS REQUIRED; CHECK TO INDICATE INFORMATION IS ATTACHED. (REQUEST WILL BE REJECTED WITHOUT REQUIRED DATA)

32.01

A. ☐ List of references where proposed product has been installed; include address, owner, architect, and date installed.
B. ☐ Product data sheets.

C. ☐ Applicable certificates and test reports.
D. ☐ Comparative Data: Provide point-by-point, side-by-side comparison of specified product and proposed substitution addressing essential attributes specified.

INDICATE WHICH OF THE FOLLOWING VOLUNTARY INFORMATION IS ATTACHED, IF ANY:
☐ DRAWINGS.
☐ SAMPLES.
☐ OTHER ITEMS: _____

SIGNATURE

THE UNDERSIGNED CERTIFIES:

The proposed substitution meets or exceeds the quality level of the specified product, equipment, assembly, or system.
To provide the same warranty for the substitution as for the specified product.
Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
The proposed substitution will have no adverse effects on other work.
The proposed substitution will not affect project schedule.
Waives claims for additional costs or time extension that may subsequently become apparent.

CONTRACTOR / COMPANY: _____
SIGNED BY: _____PRINTED NAME: _____
TITLE: _____
ADDRESS: _____
EMAIL: _____ PHONE: _____

ARCHITECT'S RESPONSE

A. During bidding, Architect will approve substitution requests by issuing an Addendum. Substitutions not approved by addendum are rejected.
B. During construction, Architect will notify Contractor in writing (see below) of decision to accept or reject request, and incorporate the substitution into the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments as provided for in the Conditions of the Contract.

☐ SUBSTITUTION APPROVED - PROVIDE SUBMITTALS PER SECTION 01 3000 AND RESPECTIVE SECTION FOR WHICH SUBSTITUTION WAS MADE.
☐ SUBSTITUTION REJECTED - PROVIDE SPECIFIED MATERIALS.

SIGNED BY: _____PRINTED NAME: _____
ARCHITECT'S COMMENTS: _____
_____
_____

END OF SECTION 01 2500.01

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 01 2500.01 - TMP Substitution Request Form.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

B. Substitutions: Any proposed substitution to be evaluated by the Architect and accepted as stipulated below.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms included in the Project Manual are adequate for this purpose, and must be used.

D. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:

B. Substitution Request Form: TMP Substitution Request Form must be completed and provided at the beginning of each substitution request.
   1. Refer to Section 01 2500.01 - TMP Substitution Request Form.
   2. Submittals without a completed TMP Substitution Request Form will not be acknowledged, reviewed, or returned. Use only this form; other forms of submission are unacceptable.

C. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Substitution Request Form: TMP Substitution Request Form must be completed and provided at the beginning of each substitution request.
   1. Refer to Section 01 2500.01 - TMP Substitution Request Form.
   2. Submittals without a completed TMP Substitution Request Form will not be acknowledged, reviewed, or returned. Use only this form; other forms of submission are unacceptable.

B. Submit request for Substitution for Cause immediately upon discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
      b. Other unanticipated project considerations.

D. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
   1. During construction, Architect's decision following review of proposed substitution will be noted on the submitted form.
   2. During bidding, Architect will approve substitution requests by issuing an Addendum. Substitutions not approved by addendum are rejected.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION 01 2500

SUBMITTAL AND SAMPLE TRANSMITTAL FORM

01 3000.01

CONST. MANAGER / CONTRACTOR	PROJECT	TMP PROJECT NO.	DATE SUBMITTED	SUBMITTAL NO.
Name and Address:	Title:	25024C, 25026C		
	Al Ritt Stadium - Improvements & Dexter High School – Athletic Improvements	* ACTION CODES		Initial Submittal ☐ Resubmittal ☐
Email:	Location:	R Reviewed – No Exceptions Taken RN Reviewed with Corrections Noted RR Revise and Resubmit X Not Approved – Resubmit NA No Action Taken – Not Reviewed		REVIEWED BY
Phone:	2521 Baker Road, Dexter MI 48130 2200 N. Parker Road, Dexter MI 48130			TMP ☐ Consultant ☐ Reviewer:

SPECIFICATION SECTION NO.	SUBCONTRACTOR / MANUFACTURER	ITEM DESCRIPTION	NO. OF SAMPLES	NO. OF SAMPLES RETURNED	ACTION CODE *	DATE REVIEWED	DATE RETURNED
Transmittal shall be for one specification section only; do not submit items from multiple sections under the same transmittal. Multi-section submittals will be returned; stamped "X - Not Approved - Resubmit"							

Submittal Stamps may be placed on subsequent blank page.

CONTRACTOR COMMENTS	ARCHITECT COMMENTS	The undersigned certifies that the above submitted items have been reviewed in detail and are correct and in strict conformance with the Contract Documents except as otherwise noted. NOTE: Approval of items submitted does not relieve Contractor from complying with all requirements of the Contract Documents.
		CONTRACTOR NAME
		SIGNATURE

This page intentionally left blank for Submittal Stamps

SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals for review, information, and project closeout.
B. Number of copies of submittals.
C. Requests for Information (RFI) procedures.
D. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 3000.01 - TMP Submittal and Sample Transmittal Form.

1.03 REFERENCE STANDARDS

A. AIA G716 - Request for Information; 2004.
B. CSI/CSC Form 13.2A - Request for Information; Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.
B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to Architect. Use one of the following:
      a. Use AIA G716 - Request for Information .
      b. Use CSI/CSC Form 13.2A - Request for Interpretation.
      c. Other format acceptable to Architect.
   3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
   4. Submit RFIs through Procore, email, or other approved method agreed to by the Architect and Owner.
      a. RFIs submitted via an internet-based submittal service are to send electronic documents to the Architect via email with a downloadable link.
C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Improper RFIs: Requests not prepared in conformance to requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response and may include an explanatory notation.
   3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response and may include an explanatory notation.

a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Discrete and consecutive RFI number, and descriptive subject/title.
3. Issue date, and requested reply date.
4. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
5. Annotations: Field dimensions and/or description of conditions which have engendered the request.
6. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Identify and include improper or frivolous RFIs.

G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 3:00 PM will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.02 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Submit at the same time as the preliminary schedule.
2. Coordinate with Contractor's construction schedule and schedule of values.
3. Format schedule to allow tracking of status of submittals throughout duration of construction.

4. Arrange information to include scheduled date for initial submittal, specification number and title, description of item of work covered, and role and name of subcontractor.
5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
    a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.03 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.04 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.05 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.06 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy.

B. Samples: Submit the number specified in individual specification sections, but not less than 3; one (minimum) of which will be retained by Architect.
1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.07 SUBMITTAL PROCEDURES

A. Transmittal Form: TMP Submittal and Sample Transmittal Form must be completed and provided at the beginning of each submittal.
1. Refer to Section 01 3000.01 - TMP Submittal and Sample Transmittal Form.

2. Submittals without a completed TMP Submittal and Sample Transmittal Form will not be acknowledged, reviewed, or returned.

B. Submittals shall be submitted in electronic form.
   1. Exceptions: Physical samples.
      a. Physical Samples must be accompanied by an electronic copy and a hard/physical copy of the completed TMP Submittal and Sample Transmittal Form.

C. Electronic Submittals: Comply with the following:
   1. Submittal process shall be through Procore, email, or other approved method agreed to by the Architect and Owner.
      a. Submittals via an internet-based submittal service are to send electronic documents to the Architect via email with a downloadable link.
   2. File Format: Portable Document Format (PDF).
   3. File Naming: File naming shall be in the following format:
      a. Specification section number, followed by a hyphen, and a consecutive number indicating sequential submittals for that section; followed by a general description of the submittal contents.
         1) Examples:
            (a) Section 07 9200; first submittal:
               (1) 07 9200-01 Joint Sealants
            (b) Section 07 9200; second submittal:
               (1) 07 9200-02 Joint Sealant Color
      b. Resubmittals. For revised resubmittals use original number and a sequential combination numerical and alphabetical suffix; hyphen followed by "R" and a two-digit consecutive number indicating sequential resubmittals for that particular submittal.
         1) Examples:
            (a) Section 07 9200; resubmittal of first submittal of section:
               (1) 07 9200-01-R01 Joint Sealants.
            (b) Section 07 9200; second resubmittal of first submittal of section:
               (1) 07 9200-01-R02 Joint Sealants
            (c) Section 07 9200; first resubmittal of second submittal of section:
               (1) 07 9200-02-R01 Joint Sealant Color
   4. Each Submittal shall be one file, complete with all attachments.
      a. Multi-file submittal will not be acknowledged, reviewed, or returned.

D. General Requirements:
   1. Use a single transmittal for related items.
      a. Each transmittal shall be for one specification section only; do not submit items for multiple sections under the same transmittal.
         1) Multi-section submittals will be acknowledged and returned; stamped "X - Not Approved - Resubmit".
   2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   3. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   4. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
   5. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 14 calendar days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 calendardays.

6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
7. When revised for resubmission, identify all changes made since previous submission.
8. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
9. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
10. Submittals not requested will be recognized and returned; stamped "NA - No Action Taken - Not Reviewed"

E. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products unless specifically called for in individual sections.

F. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
4. Non-complying submittals will be acknowledged and returned; stamped "X - Not Approved - Resubmit".

G. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Submit actual physical samples.
4. Electronic submittals will not be accepted unless prior approval is received from the Architect. Electronic samples without prior approval will be acknowledged and returned; stamped "X - Not Approved - Resubmit."

3.08 SUBMITTAL REVIEW

A. General: Submittals that do not conform to the requirements of this section will not be acknowledged, reviewed, or returned.

B. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

C. Submittals for Information: Architect will acknowledge and may review. See below for actions to be taken.

D. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Where more than one action has been indicated, each shall apply to that portion of the submittal for which the action is indicated.

E. Architect's review shall not indicate approval of dimensions, quantities or fabrication processes unless specific notations are made by the Architect regarding same.

F. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
a. "Reviewed - No Exceptions Taken", "Approved", or language with same legal meaning.
b. "Reviewed with Corrections Noted", "Approved as Noted, Resubmission not required", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.

2. Not Authorizing fabrication, delivery, and installation:
   a. "Revise and Resubmit", "Not Approved - Resubmit", or language with the same legal meaning.
      1) Resubmit revised item, with review notations acknowledged and incorporated.
3. Not Authorizing manufacturer:
   a. Rejected - Resubmit, or language with the same legal meaning.

G. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
   a. "No Action Taken - Not Reviewed" or "Received" - to notify the Contractor that the submittal has been received for record only.

END OF SECTION 01 3000

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.
B. Quality assurance.
C. References and standards.
D. Testing and inspection agencies and services.
E. Contractor's design-related professional design services.
F. Control of installation.
G. Mock-ups.
H. Tolerances.
I. Manufacturers' field services.
J. Defect Assessment.

1.02 REFERENCE STANDARDS

A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025b.
B. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2026.
C. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

1.03 DEFINITIONS

A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
    1. Design Services Types Required:
        a. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.04 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
B. Base design on performance and/or design criteria indicated in individual specification sections.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
    1. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
    2. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
C. Test Reports: After each test/inspection, promptly submit 1 copies of report to Architect and to Contractor.
    1. Include:

a. Date issued.
b. Project title and number.
c. Name of inspector.
d. Date and time of sampling or inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of test/inspection.
h. Date of test/inspection.
i. Results of test/inspection.
j. Compliance with Contract Documents.
k. When requested by Architect, provide interpretation of results.

2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time specialist and responsible officer.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.07 REFERENCES AND STANDARDS

A. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

B. Obtain copies of standards where required by product specification sections.

C. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

A. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:

1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, and ASTM E699.
2. Inspection agency: Comply with requirements of ASTM E329.
3. Laboratory Staff: Maintain a full time specialist on staff to review services.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
B. Comply with manufacturers' instructions, including each step in sequence.
C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
E. Have work performed by persons qualified to produce required and specified quality.
F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.
D. Notify Architect 5 working days in advance of dates and times when mock-ups will be constructed.
E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
H. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Make corrections as necessary until Architect's approval is issued.
I. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
J. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.
B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.
C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.
D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 48 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION 01 4000

SECTION 01 4100 - REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

A. Regulatory requirements applicable to this project are the following:
   1. ASHRAE Std 90.1 I-P-2019 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2019, with Errata and Addenda (2021).
   2. Barrier Free Code: Comply with the following:
      a. Michigan Building Code; 2021.
      b. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
   3. School Fire Safety Rules: Michigan School Fire Safety Rules; 2016.
      a. Includes NFPA 101-2012 - Life Safety Code; 2012, plus amendments.
   4. Building Code: Michigan Building Code; 2021.
   5. Plumbing Code: Michigan Plumbing Code; 2021.
   6. Mechanical Code: Michigan Mechanical Code; 2021.
   7. Electrical Code: NFPA 70 - National Electric Code; 2023.
      a. Includes 2023 Michigan Construction Code - Part 8 Electrical Code Rules.
   8. Elevator Code: Comply with the following:
      a. ASME A17.1 - Safety Code for Elevators and Escalators; 2016.
      b. ASME A18.1- Safety Standard for Platform Lifts and Stairway Chairlifts; 2017.
      c. 2023 Michigan Elevator Safety Board General Rules.
   9. Boiler Code: Michigan Boiler Code.
      a. Includes the following:
         1) ASME Boiler and Pressure Vessel Codes; 2019.
         2) National Board Inspection Code; 2019.
         3) PA 407 Skilled Trades Regulation Act; 2016.
   10. Energy Code: Michigan Commercial Energy Code; 2021.
      a. Includes ASHRAE Std 90.1 I-P-2019 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2019.
   11. Existing Building Code: Michigan Rehabilitation Code; 2021.

B. Where specification sections reference more current standards or codes, comply with the more restrictive requirements unless notified in writing by Architect.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 4100

SECTION 01 4216 - DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Furnish: To supply, deliver, unload, and inspect for damage.

B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

D. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.

E. Provide: To furnish and install.

F. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 4216

SECTION 01 4219 - REFERENCE STANDARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements relating to referenced standards.

1.02 QUALITY ASSURANCE

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with the reference standard of date of issue , except where a specific date is established by applicable code.

C. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION -- NOT USED

END OF SECTION 01 4219

SECTION 01 4533 - CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Code-required special inspections.
B. Submittals.

1.02 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authority having jurisdiction.
B. NIST: National Institute of Standards and Technology.

1.03 DEFINITIONS

A. Code or Building Code: Michigan Building Code; 2021, specifically Chapter 17 - Special Inspections and Tests.
B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.
C. Special Inspection:
   1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.
   2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.04 REFERENCE STANDARDS

A. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2025b.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
   1. Submit agency name, address, and telephone number, names of full time specialist and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Submit certification that Special Inspection Agency is acceptable to AHJ.
C. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to the AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of Special Inspector.
      d. Date and time of special inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of special inspection.
      h. Date of special inspection.
      i. Results of special inspection.
      j. Compliance with Contract Documents.

2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

D. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of Special Inspector.
      d. Date and time of special inspection.
      e. Identification of fabricated item and specification section.
      f. Location in the Project.
      g. Results of special inspection.
      h. Verification of fabrication and quality control procedures.
      i. Compliance with Contract Documents.
      j. Compliance with referenced standard(s).

E. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one to AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test or inspection.
      h. Date of test or inspection.
      i. Results of test or inspection.
      j. Compliance with Contract Documents.

1.06 SPECIAL INSPECTION AGENCY

A. Owner will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.07 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:
   1. Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
   1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.02 SPECIAL INSPECTIONS

A. Special inspections and testing shall be for materials, installation, fabrication, erection or placement of components and connections as indicated on Drawings, but not less than that required by the building code.

END OF SECTION 01 4533

SECTION 01 5639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Sections:
1. Section 31 1000 "Site Clearing" for selective removal of existing plants.

1.03 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inchesabove the ground for trees up to, and including, 4-inchsize; and 12 inchesabove the ground for trees larger than 4-inchsize.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.04 ACTION SUBMITTALS

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

B. Samples for Verification: For each type of the following:
1. Organic Mulch: 1-quart volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.

C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
1. Species and size of tree.
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.
5. Description of maintenance following pruning.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
   1. Use sufficiently detailed photographs or videotape.
   2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.06 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA.

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

C. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
      a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
      b. Enforcing requirements for protection zones.
      c. Arborist's responsibilities.
      d. Arborist supervision.
      e. Field quality control.

1.07 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
   1. Type: Shredded hardwood.
   2. Size Range: 3 inchesmaximum, 1/2 inchminimum.
   3. Color: Natural.

B. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and weighing a minimum of 0.4 lb/ft.; remaining flexible from minus 60 to plus 200 deg F; inert to most chemicals and acids; minimum tensile yield strength of 2000 psi and ultimate tensile strength of 2680 psi; secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches apart.
   1. Height: 48 inches.
   2. Color: High-visibility orange, nonfading.

C. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly fabricated with non-fading lettering and as follows:
   1. Text: “TREE PROTECTION ZONE – NO ACCESS”.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

C. All work within or immediately adjacent to the root zone of any tree shall be observed by a certified arborist. No work shall take place without the arborist present.

3.02 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation protection zones.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.03 TREE- AND PLANT-PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 50-feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
   1. Relocate protection-zone fencing as needed to facilitate construction operations. Relocations shall be approved by Landscape Architect prior to beginning or resuming construction operations.

3.04 EXCAVATION

A. General: Excavation within protection zones shall be by pneumatic operations according to requirements in Section 31 2000 "Earth Moving."

B. Excavation near Trees: Where excavation is required within protection zones, pneumatically excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or piercing. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots under direct supervision of arborist and as required for root pruning.

C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots under direct supervision of arborist and as required for root pruning.

D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.05 ROOT PRUNING

A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:
   1. Notify arborist. All excavation and root pruning shall occur under direct supervision of a certified arborist.
   2. Cut roots manually by hand or pneumatically digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
   3. Cut Ends: Do not paint cut root ends.
   4. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
   5. Cover exposed roots with burlap and water regularly.
   6. Backfill immediately according to requirements in Section 31 2000 "Earth Moving."

3.06 CROWN PRUNING

A. Crown or branch pruning shall be limited to that required for clearance of new light poles and fixtures. Branches to be pruned shall be marked for approval of Architect and arborist prior to pruning.

B. Prune branches approved branches under direct supervision of certified arborist as follows:
   1. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and the following:
      a. Type of Pruning: Cleaning, Raising, Reduction.
   2. Cut branches with sharp pruning instruments; do not break or chop.
   3. Do not apply pruning paint to wounds.

C. Remove pruning debris and legally dispose of off-site.

3.07 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.08 REPAIR, REPLACEMENT AND MITIGATION

A. Damage to trees, shrubs, and other vegetation will be taken very seriously and require mitigation at the Contractor’s expense. Actively and aggressively protect all existing trees and vegetation during construction.

B. Repair, replacement, and mitigation for damaged trees and other vegetation will be determined solely by the Architect and Owner based on the severity of immediate and long-term damage.

3.09 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 01 5639

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Re-use of existing products.
B. Transportation, handling, storage and protection.
C. Product option requirements.
D. Substitution limitations.
E. Procedures for Owner-supplied products.
F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
    1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
    1. Refer to Drawings and Section 02 4100 - Demolition.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
D. Available Products: Products specified by naming one or more Manufacturers as an Available Product indicates that these Manufacturers' products may be provided but other comparable products and Manufacturers not named may also be provided without submitting a request for substitution.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:

1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:

1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

F. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

G. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.
J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
L. Prevent contact with material that may cause corrosion, discoloration, or staining.
M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 6000

SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
    1. Structural integrity of any element of Project.
    2. Integrity of weather exposed or moisture resistant element.
    3. Efficiency, maintenance, or safety of any operational element.
    4. Visual qualities of sight exposed elements.
    5. Work of Owner or separate Contractor.
    6. Include in request:
        a. Identification of Project.
        b. Location and description of affected work.
        c. Necessity for cutting or alteration.
        d. Description of proposed work and products to be used.
        e. Effect on work of Owner or separate Contractor.
C. Project Record Documents: Accurately record actual locations of capped and active utilities.
D. Warranties: For each affected material under warranty, submit written verification, signed by manufacturer of existing materials, stating that the Owner's full warranty will remain in effect after cutting and patching operations have been completed

1.04 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.05 PROJECT CONDITIONS

A. Use of explosives is not permitted.
B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
D. Perform dewatering activities, as required, for the duration of the project.

E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
   2. Indoors: Limit conduct of especially noisy interior work to the hours of 6 pm to 7 am.
I. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
B. Notify affected utility companies and comply with their requirements.
C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
F. Coordinate completion and clean-up of work of separate sections.
G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.07 WARRANTIES

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.
B. Seal cracks or openings of substrate prior to applying next material or substance.
C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
B. Require attendance of parties directly affecting, or affected by, work of the specific section.
C. Notify Architect 5 calendar days in advance of meeting date.
D. Prepare agenda and preside at meeting:
    1. Review conditions of examination, preparation and installation procedures.
    2. Review coordination with related work.
E. Record minutes and distribute copies within two days after meeting to participants, with 1 copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.
B. Promptly notify Architect of any discrepancies discovered.
C. Contractor shall locate and protect survey control and reference points.
D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
G. Utilize recognized engineering survey practices.
H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
2. Grid or axis for structures.
3. Building foundation, column locations, ground floor elevations.
4. Controlling lines and levels required for mechanical and electrical trades.

I. Periodically verify layouts by same means.

J. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation only.
1. Verify that construction and utility arrangements are as indicated.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
1. Provide, erect, and maintain temporary dustproof partitions.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings.
2. Relocate items indicated on drawings.
3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.

a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
b. Provide temporary connections as required to maintain existing systems in service.

4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

J. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
      a. This includes painted surfaces.
      b. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architectand Owner 7 calendar days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

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

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.
B. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.
D. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
E. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
F. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.
B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
E. Clean filters of operating equipment.
F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
G. Clean site; sweep paved areas, rake clean landscaped surfaces.
H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
B. Accompany Contractor on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

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

END OF SECTION 01 7000

SECTION 01 7329 - CUTTING AND PATCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cutting and patching.

1.02 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:

1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.
6. Include in request:
   a. Location and description of affected work.
   b. Necessity for cutting or alteration.
   c. Description of proposed work and products to be used.
   d. Effect on work of Owner or separate Contractor.

C. Warranties: For each affected material under warranty, submit written verification, signed by manufacturer of existing materials, stating that the Owner's full warranty will remain in effect after cutting and patching operations have been completed.

1.04 WARRANTIES

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

1. Materials that are still under warranty include, but are not limited to, the following:
   a. _____.
   b. _____.
   c. _____.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

B. Prior to Patching: Before patching, verify compatibility and suitability of substrates, including compatibility with existing finishes or primers. Beginning of patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.
B. Seal cracks or openings of substrate prior to applying next material or substance.
C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.
D. Protect existing work to remain.
    1. Prevent movement of structure; provide shoring and bracing if necessary.
    2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
E. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.03 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.
B. Perform whatever cutting and patching is necessary to:
    1. Complete the work.
    2. Fit products together to integrate with other work.
    3. Provide openings for penetration of mechanical, electrical, and other services.
    4. Match work that has been cut to adjacent work.
    5. Repair areas adjacent to cuts to required condition.
    6. Repair new work damaged by subsequent work.
    7. Remove samples of installed work for testing when requested.
    8. Remove and replace defective and non-conforming work.
C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
D. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
E. Cutting:
    1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces.
    2. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
    3. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
F. Restore work with new products in accordance with requirements of Contract Documents.
G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400 - Firestopping, to full thickness of the penetrated element.
I. Patching:
    1. Repair adjacent construction and finishes damaged during removal work and cutting work.
    2. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
        a. This includes painted surfaces.
        b. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
    3. Match color, texture, and appearance.

4. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

END OF SECTION 01 7329

SECTION 01 7800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.
B. Operation and maintenance data.
C. Warranties and bonds.

1.02 SUBMITTALS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. General:
   1. Project Record Documents include:
      a. Complete set of Record Drawings.
      b. Complete set of Record Submittals.
      c. Complete set of Specifications.
   2. Project Record Documents shall be submitted in electronic form.
      a. File Format: Portable Document Format (PDF).
      b. Files shall be named and organized in a searchable, easy to understand, system.
   3. Ensure entries are complete and accurate, enabling future reference by Owner.
   4. Record information concurrent with construction progress.
B. Record Drawings: Record Drawings shall include the following:
   1. Complete set of Drawings.
      a. Indicate and record actual construction including, but not limited to, the following:
         1) Show all systems and assemblies as they exist at completion of the Work.
         2) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
         3) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
         4) Field changes of dimension and detail.
         5) Details not on original Contract drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.

C. Record Submittals: Record Submittals shall include the following:
   1. Complete set of Submittals, including resubmittals.
   2. Shop Drawings shall indicate all field changes and other variations from the Submittal as originally reviewed by Architect.
D. Specifications: Specifications shall include the following:
   1. Complete Project Manual including all specifications, front end material, reports, and information available to bidders, as originally bid.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.

3.02 OPERATION AND MAINTENANCE DATA

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

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
C. Additional information as specified in individual product specification sections.
D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.
B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
D. Include color coded wiring diagrams as installed.
E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
G. Provide servicing and lubrication schedule, and list of lubricants required.
H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.
J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
K. Provide control diagrams by controls manufacturer as installed.
L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
M. Include test and balancing reports.
N. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. General:
   1. Operational and Maintenance Manuals include:
      a. Operational and maintenance data.
      b. Operational and maintenance data for materials and finishes.
      c. Operational and maintenance data for equipment and systems.
   2. Operational and Maintenance Manuals shall be submitted both in electronic form and as hard copy/durable manuals.
      a. Subject to Owner approval, hard copy/durable manuals may be omitted.
      b. Electronic File Format: Portable Document Format (PDF).
         1) Files shall be named and organized in a searchable, easy to understand, system similar to the descriptions for the hard copy/durable manuals
B. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
C. Where systems involve more than one specification section, provide separate tabbed divider for each system.
D. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 3 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
E. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
F. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
G. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
H. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
I. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
J. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
K. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Operation and maintenance data.
      c. Field quality control data.
      d. Photocopies of warranties and bonds.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION 01 7800

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit not less than four weeks prior to start of training.
   2. Revise and resubmit until acceptable.
   3. Provide an overall schedule showing all training sessions.
   4. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.03 QUALITY ASSURANCE

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

B. Coordination: Coordinate demonstration and training of this section with project commissioning requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.
2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:

1. The location of the O&M manuals and procedures for use and preservation; backup copies.
2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:

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

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 01 7900

SECTION 02 4100 - DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.
B. Salvaged items.
C. Removed and reinstalled items.

1.02 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.04 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of 5 years of documented experience.

PART 2 PRODUCTS - NOT USED

2.01 MATERIALS

A. Fill Material: As specified in Division 31.

PART 3 EXECUTION

3.01 SCOPE

A. Remove portions of existing building as indicated on Drawings including, but not limited to, the following:
   1. Remove other items indicated, for salvage and relocation.
   2. Unless otherwise indicated, fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Division 31.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 7000.
B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Prior to start of demolition operations, perform an engineering survey of building condition to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures.
   4. Use of explosives is not permitted.
   5. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   6. Provide, erect, and maintain temporary barriers and security devices.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
C. Do not begin removal until receipt of notification to proceed from Owner.
D. Do not begin removal until built elements to be salvaged or relocated have been removed.

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

3.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction as specified and/or indicated on Drawings .
C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on Drawings.
E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.04 SALVAGED ITEMS

A. Clean salvaged items.
B. Pack or crate items after cleaning. Identify contents of containers.
C. Store items in a secure area until delivery to Owner.
D. Transport items to Owner's storage area on-site.
E. Protect items from damage during transport and storage.

3.05 REMOVED AND REINSTALLED ITEMS

A. Clean and repair items to functional condition adequate for intended reuse.
B. Pack or crate items after cleaning and repairing. Identify contents of containers.
C. Protect items from damage during transport and storage.
D. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.06 EXISTING ITEMS TO REMAIN

A. Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete

3.07 DEBRIS AND WASTE REMOVAL

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

END OF SECTION 02 4100

SECTION 03 3053 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

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

1.02 ACTION SUBMITTALS

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

B. Shop Drawings: As required in project documents.

C. Other Action Submittal:
1. Design Mixtures: For each concrete mixture.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:
1. Installer: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following:
1. Steel reinforcement and reinforcement accessories.
2. Cementitious material.
3. Admixtures.
4. Fiber reinforcement.
5. Curing compounds.
6. Bonding agents.
7. Vapor retarders.
8. Joint fillers.
9. Concrete mixture materials.
10. Concrete mixing.
11. Repair materials.

C. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Ready-Mix-Concrete 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.

B. Comply with ACI 301.

C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. Comply with Michigan Department of Transportation Standard Specifications for Construction, most current edition.

PART 2 - PRODUCTS

2.01 FORMWORK

A. Furnish formwork and formwork accessories according to ACI 301.

2.02 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

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

C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

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

E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

2.03 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.
      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 Aggregate: ASTM C 33, graded, 3/4-inch nominal maximum aggregate size.

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

2.04 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. 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.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.05 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 incheslong.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Monofilament Fibers:
         1) Axim Italcementi Group, Inc.; FIBRASOL II P.

2) Euclid Chemical Company (The), an RPM company; Fiberstrand 100, Fiberstrand 150.
3) Grace, W. R. & Co. - Conn.; Grace MicroFiber.
4) Metalcrete Industries; Polystrand 1000.
5) QC Construction Products; QC FIBERS.

2.06 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

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.

2.07 RELATED MATERIALS

A. Bonding Agent: ASTM C 1059, Type II, non-redispersible acrylic emulsion or styrene butadiene.

B. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A or B.

C. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick; or plastic sheet, ASTM E 1745, Class C.

D. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.08 CONCRETE MIXTURES

A. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Air Content: Maintain within range permitted by ACI 301.

2.09 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 above 90 deg F, reduce mixing and delivery time to 60 minutes.

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.03 STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.04 CONCRETE PLACEMENT

A. Comply with ACI 301for placing concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. Do not add water to concrete during delivery, at Project site, or during placement.

D. Consolidate concrete with mechanical vibrating equipment.

3.05 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding 1/2 inch.
1. Apply to concrete surfaces not exposed to view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
   1. Apply to concrete surfaces exposed to view.

3.06 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 with ACI 301 for hot-weather protection during curing.

B. 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.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   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.

3.07 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests: Perform according to ACI 301.
   1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
   2. Testing Frequency: One composite sample shall be obtained for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

3.08 REPAIRS

A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION 03 3053

SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.
B. Reinforcement and anchorage.
C. Flashings.
D. Accessories.
E. Products installed under this section:
   1. Cast stone units set in masonry; furnished by Section 04 7200 - Cast Stone Masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 7200 - Cast Stone Masonry: Cast stone trim installed in masonry.
B. Section 07 1900 - Water Rep[ellant

1.03 REFERENCE STANDARDS

A. ACI 315 - Guide to Presenting Reinforcing Steel Design Details; 2018.
B. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.
C. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications; 2018.
D. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.
E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
F. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.
G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2025.
H. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
I. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
J. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.
K. ASTM C91/C91M - Standard Specification for Masonry Cement; 2025.
L. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2025.
M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025a.
N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
O. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
P. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
Q. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2022.
R. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2024.
S. ASTM C 1329 - Standard Specification for Mortar Cement - 2016.
T. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
U. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.

V. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2020.
W. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
X. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.
B. Product Coordination and Limitations: Provide products that when combined with materials and components of other sections, form exterior wall assemblies as detailed on Drawings, that comply with NFPA 285 testing and acceptance criteria.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide data for the following:
    1. Masonry Units:
        a. Include data on material properties.
        b. Masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
    2. Cementitious materials. Include name of manufacturer, brand name and type.
    3. Mortar admixturers.
    4. Preblended, dry mortar mixes. Include description of type and proportion of ingredients.
    5. Grout mixes. Include description of type and proportion of ingredients.
    6. Anchors, ties, weep/cavity vent, preformed control-joint gaskets, cavity drainage material, and metal accessories.
C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for masonry.
    1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special units.
    2. Reinforcing: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars.
        a. Comply with ACI 315.
    3. Flashings: Provide details of embedded flashings including end dams, corners, drips, weeps.
D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
    1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C91/C 91M for air content.
    2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirements.
E. Samples: Submit 3 samples of standard block, decorative block, facing brick, ceramic glazed facing brick, and ceramic glazed structural clay facing tile units to illustrate color, texture, and extremes of color range.
F. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.
G. Test Reports:
    1. Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

2. Masonry Veneer Anchors: At wall cavities greater than 4-1/2 inches, provide masonry veneer anchor manufacturer's test reports indicating compliance with TMS 402/602 for lateral load requirements; wall cavity depth includes airspace and cavity wall insulation thickness.

H. NFPA 285 Documentation: For each product, submit documentation listing compatible materials and components that when used together in wall assemblies as detailed on Drawings, comply with NFPA 285 testing and acceptance criteria.

I. Manufacturer's Qualification Statement.

J. Installer's Qualification Statement.

K. Cold-Weather and Hot-Weather Procedures: Detail description of methods, material, and equipment to be used to comply with requirements.

1.06 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum 5 years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

1.07 MOCK-UPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for material and execution.

B. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, wall openings, flashings (with lap joint, corner, and end dam), through-wall flashing (omit masonry above half of flashings, wall insulation, and sealant-filled joint at least 16 inches long in exterior wall in mock-up.

C. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.

D. Locate where directed.

E. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.

F. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.

G. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

1. Approval of mockups is also for other materials and construction qualities specifically approved by Architect in writing.
2. Approval of mockups does not constitute approval of deviations from Contract Documents contained in the mock-ups unless Architect specifically approves such deviations in writing.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Store masonry units on elevated platforms in a dry location. If units are not stored in a enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

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

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
F. Handle and store ceramic glazed masonry units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

1.09 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, protections, and sills with waterproof sheeting at end of each days's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls, and hold cover securely in place.
   2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe, and hold cover in place.
B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
C. Stain Prevention: 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.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over 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 the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
D. 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 unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in **TMS 602/ACI 530.1/ASCE 6**.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in **TMS 602/ACI 530.1/ASCE 6**.

PART 2 PRODUCTS

2.01 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet (6 m) vertically and horizontally of a walking surface.
C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
   1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.02 CONCRETE MASONRY UNITS (CMU)

A. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
2. Special Shapes: Provide non-standard blocks configured for corners, headers, control joint edges, and other detailed conditions.
3. Exposed Outside Block Corners: Provide bullnose, radiused, corners unless otherwise indicated on Drawings.
   a. Field-ground radiused corners are not permitted.
   b. Stop bullnose at bulkhead/soffits.
   c. Provide square corners at door frame even with block and bullnose where door frame is set back from corner.
4. Load-Bearing and Non-Loadbearing Units: ASTM C90, normal weight.
   a. Decorative Units:
      1) Split-face:
         (a) Unit Compressive Strength:Provide units with minimum average net-area compressive strength of 2,150 pounds per square inch.
         (b) To be formulated using Integral Water Repellent as per Sentence 2.02.A.5
         (c) Size:
            (1) Width: Nominal 8 inches (actual 7 5/8 inches).
            (2) Height: Nominal 8 inches (actual 7 5/8 inches).
            (3) Length: Nominal 10 inches and 12 inches as indicated.
         (d) Color and Texture: To match the Architect's sample selected from the manufacturer's full range..
         (e) Pattern: As indicated on Drawings.
         (f) Factory-Applied Sealer: Not Allowed.
            (1) Refer to Section 07 1900 WATER REPELLENT ACRYLIC PENETRATING SEALER for field applied sealer.
         (g) Manufacturers:
            (1) Grand Blanc Cement Products: www.grandblanccementproducts.com.
            (2) Substitutions: Not permitted.
      2) Scored: Vertical single score.
         (a) To be formulated using the Integral Water Repellent as per Sentence 2.02.A.5.
         (b) Size:
            (1) Width: Nominal 8 inches (actual 7 5/8 inches).
            (2) Height Nominal 8 inches (actual 7 5/8 inches).
            (3) Length: Mominal 8 invches and 16 inches to match coursing of adjacent decorative CMU.
         (c) Color: Manufacturer's standard color and texture.
         (d) Manufacturers:
            (1) Best Block Company: www.bestblock.net.
            (2) Consumers Concrete Corp.: www.consumersconcrete.com.
            (3) Echelon by Oldcastle: www.echelonmasonry.com.
            (4) Fendt Builder’s Supply, Inc.: www.fendtproducts.com.
            (5) Grand Blanc Cement Products: www.grandblanccementproducts.com.
            (6) Michigan Certified Products, Inc.: www.micertconcrete.com.
            (7) National Block Company: www.nationalblock.com.
            (8) Substitutions: See Section 01 6000 - Product Requirements.
5. Units with Integral Water Repellent: Concrete block units as specified in this section with polymeric liquid admixture added to concrete masonry units at the time of manufacture.
   a. Locations: Provide at exposed exterior concrete block and elsewhere as indicated.
   b. Performance of Units with Integral Water Repellent:

1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
   (a) No water visible on back of wall above flashing at the end of 24 hours.
   (b) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
   (c) No more than 25 percent of wall area above flashing visibly damp at end of test.
2) Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
3) Compressive Strength: ASTM C1314; maximum 5 percent decrease.

c. Limitations:
1) Use only in combination with mortar containing integral water repellent admixture.
2) Source Limitations: Use water repellent admixtures for masonry units and mortar from a single manufacturer.

d. Products:
1) BASF Corp.; MasterPel 240: www.master-builders-solutions.basf.us.
2) 04 2 (The); an RPM company; Eucon Blocktite Admixture: www.euclidchemical.com.
3) GCP Applied Technologies Inc.; Dry-Block Block Admixture: www.gcpat.com.
4) Substitutions: See Section 01 6000 - Product Requirements.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M.
B. Mortar Cement: ASTM C1329.
C. Mortar Aggregate: ASTM C144.
D. Grout Aggregate: ASTM C404.
E. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
1. Color(s): As selected by Architect from manufacturer's full range.
2. Manufacturers:
   a. Davis Colors: www.daviscolors.com.
   b. Lambert Corporation: www.lambertusa.com.
   c. Solomon Colors: www.solomoncolors.com/sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.
F. Water: Clean and potable.
G. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
1. Locations: Provide at exposed exterior concrete block and elsewhere as indicated.
2. Limitations:
   a. Use only in combination with masonry units manufactured with integral water repellent admixture.
   b. Source Limitations: Use water repellent admixtures for masonry units and mortar from a single manufacturer.
3. Meet or exceed performance specified for water repellent admixture used in masonry units.
4. Products:
   a. BASF Corp.; MasterPel 210MA: www.master-builders-solutions.basf.us.
   b. Euclid Chemical Company (The); an RPM company; Blocktite Mortar Admixture: www.euclidchemical.com.
   c. GCP Applied Technologies Inc.; Dry-Block Mortar Admixture: www.gcpat.com.
   d. Substitutions: See Section 01 6000 - Product Requirements.
H. Packaged Dry Material for Mortar for Unit Masonry:

1. At Contractor's option, prepackaged dry material for mortar may be used subject to compliance with mortar requirements of this section including, but not limited to, the following:
   a. Mortar Types: As indicated.
   b. Color(s): As selected by Architect from manufacturer's full range.
   c. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
2. Portland Cement Based: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   a. Manufacturers:
      1) Amerimix, an Oldcastle brand; www.amerimix.com.
      2) The QUIKRETE Companies; wwwquikcrete.com.
      3) SPEC MIX, Inc.: www.specmix.com.
      4) Substitutions: See Section 01 6000 - Product Requirements.
3. Masonry Cement Based: Premixed masonry cement and mason's sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   a. Manufacturers:
      1) Amerimix, an Oldcastle brand; www.amerimix.com.
      2) The QUIKRETE Companies; wwwquikcrete.com.
      3) SPEC MIX, Inc.: www.specmix.com.
      4) Substitutions: See Section 01 6000 - Product Requirements.

I. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
1. At Contractor's option, prepackaged dry material for grout may be used subject to compliance with grout requirements of this section.
2. Manufacturers:
   a. Amerimix, an Oldcastle brand; www.amerimix.com.
   b. The QUIKRETE Companies; wwwquikcrete.com.
   c. SPEC MIX, Inc.: www.specmix.com.
   d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
1. Basis-of-Design Product: The design for each item specified is based on the product named. Provide either the named product or a comparable product by one of the following:
   a. Fero Corp.; www.ferocorp.com.
   b. Heckmann Building Products; www.heckmannbuildingprods.com.
   c. Hohmann & Barnard, Inc.; www.h-b.com.
   d. Wire-Bond; www.wirebond.com.
   e. Substitutions: See Section 01 6000 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; uncoated.

C. Reinforcing Bar Positioners: 0.156 inch, ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to 16 CFR 1201 Class B.
1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: RB and RB-Twin Rebar Positioners.

D. Reinforcing Bar Lap Joint Ties: ASTM A1064/A1064M steel wire, mill galvanized to 16 CFR 1201 Class 3.
1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: Spyra-Lox Rebar Lap-Joint Tie.

E. Single Wythe Joint Reinforcement: Truss or ladder type; ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to 16 CFR 1201 Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
   1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: 120 Truss-Mesh or 220 Ladder-Mesh.

F. Adjustable Multiple Wythe Joint Reinforcement: Truss or ladder type with adjustable ties or tabs spaced at 16 in on center ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire; width of components as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from each masonry face.
   1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: 170 Truss LOX-ALL Adjustable Eye Wire or 270 Ladder LOX-ALL Adjustable Eye Wire with 2X-HOOK.

G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches; hot dip galvanized to ASTM A153/A153M Class B.
   1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: 344 Rigid Partition Anchor.

H. Partition Top Anchors: 0.1875 inch thick metal plate with a 3/8 inch diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube; hot dip galvanized to ASTM A153/A153M Class B.
   1. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: PTA-420-HS and PTA Tubes.

I. Dovetail Anchor Slots for Connecting to Concrete: 2-piece anchors that permit differential movement between masonry and concrete frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.
   1. Concrete frame: Dovetail anchors of bent steel, nominal 1 inch width by 1 inch deep by 0.03 in thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
      a. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: 305 Dovetail Slot with 315 Flexible Dovetail Brick Ties.

J. Adjustable Anchors for Connecting to Structural Steel Framing: 2-piece anchors that permit differential movement between masonry and steel frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.
   1. Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
   2. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: 359/359FP anchors with 301W or VBT ties.

K. Adjustable Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. For cold-formed metal framing and sheathing back-up.
   2. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners.
   3. Wire ties: Rectangular shape, 0.1875 inch thick.
   4. Vertical adjustment: Not less than 2 inches.
   5. Basis-of-Design Product: Hohmann & Barnard, Inc.; www.h-b.com: HB-213 anchors with 2X-HOOK.

2.05 FLASHINGS

A. Flexible Fabric Flashing - Self-Adhering: Self-adhering stainless steel/polymer fabric flashing. ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on one side to one sheet of polymer fabric. Flashing shall be self-adhering using a pressure-sensitive adhesive.
   1. Type 304 stainless steel.
      a. Thickness: 2 mils, minimum.
   2. Manufacturers:
      a. Hohmann & Barnard, Inc; Mighty-Flash Stainless Flashing SA: www.h-b.com/#sle.
      b. WIRE-BOND; Bond-N-Flash SA: www.wirebond.com/#sle.
      c. York Manufacturing, Inc; Multi-Flash SS: www.yorkmfg.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Factory-Fabricated Inside and Outside Flashing Corners and End Dams: Stainless steel.
   1. Manufacturer shall be the same as flexible fabric flashing manufacturer.

C. Factory-Fabricated Drip Plates including Inside and Outside Corners: Stainless steel.
   1. Pre-formed smooth drip plates with hemmed edges.
   2. Manufacturer shall be the same as stainless steel/polymer fabric flashing manufacturer.

D. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.
   1. Manufacturer shall be the same as flexible fabric flashing manufacturer.

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints. ASTM D2000, 2AA-805.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc: www.h-b.com/sle.
      b. WIRE-BOND: www.wirebond.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Compressible Joint Filler: Closed cell neoprene; oversized 50 percent to joint width; self expanding; in maximum lengths available. ASTM D1056, Grade 2A1.
   1. Manufacturers:
      a. Hohmann & Barnard, Inc: www.h-b.com/sle.
      b. WIRE-BOND: www.wirebond.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

C. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.

D. Multicomponent Cavity Wall Drainage System: Combination mortar diverter, flashing and weep system.

E. Masonry Cleaners:
   1. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
      a. Basis-of-Design Products: Provide PROSOCO, Inc.; www.prosoco.com: Sure Klean 600 or Sure Klean Vana Trol or a comparable product by one of the following:
         1) Diedrich Technologies, Inc.; www.diedrichtechnologies.com.
         2) Substitutions: See Section 01 6000 - Product Requirements.

2.07 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type N.

4. Interior, loadbearing masonry: Type S.
5. Interior, non-loadbearing masonry: Type N.
6. Precast concrete units: Same Type as wall masonry in which unit is set.
7. Limestone units: Same Type as wall masonry in which unit is set.
8. Pointing Mortar: Type N.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
1. Grout Strength: 3000 psi at 28 days, unless otherwise indicated.

D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

E. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that foundations are within tolerances specified.

C. Verify that related items provided under other sections are properly sized and located.

D. Verify that built-in items are in proper location, and ready for roughing into masonry work.

E. Verify that reinforcing dowels are properly placed.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

3.03 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.04 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. Existing Masonry: Match coursing and bonding of existing masonry unless otherwise indicated.

D. Concrete Masonry Units: Unless otherwise indicated:
1. Bond: Running.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.
4. Mortar Joint Thickness: 3/8 inch.

3.05 PLACING AND BONDING

A. Lay hollow masonry units with face shell bedding on head and bed joints.
B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
C. Remove excess mortar and mortar smears as work progresses.
D. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
E. Interlock intersections and external corners.
F. Tooth-in new masonry work with existing, unless otherwise indicated on Drawings.
G. Tooth-in cutting and patching masonry work unless otherwise indicated on Drawings.
H. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
I. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
J. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
L. Isolate cast stone units from clay masonry with building paper or similar method of providing a continuous bond break/slip plane.
M. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
    1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
    2. Allow cleaned surfaces to dry before setting.
    3. Wet joint surfaces thoroughly before applying mortar.
    4. Rake out mortar joints for pointing with sealant.

3.06 HORIZONTAL JOINT REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place continuous joint reinforcement in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches.
E. Masonry to Structural Steel and Concrete:
    1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
    2. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 24 inches horizontally and 24 inches vertically.
F. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.07 MASONRY FLASHINGS

A. General:
    1. Install masonry flashings according to manufacturer's instructions and as indicated on the Drawings.
    2. Remove or cover protrusions or sharp edges that could puncture flashings.
    3. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

4. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   a. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up at least 8 inches, minimum, to form watertight pan at non-masonry construction.
5. Terminate flashing up 8 inches minimum on vertical surface of backing:
   a. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's direction, unless otherwise indicted.
   b. Anchor vertical leg of flashing into backing with a termination bar and sealant.
6. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7, unless more stringent requirements are specified in this section.

B. Flexible Fabric Flashing:
1. Use factory-fabricated drip plates, corners and end dams.
2. Extend flexible fabric flashing to within 1/4 inch of exterior face of masonry overlapping metal drip plate.
3. Extend flexible fabric flashing full width of cavity space and turn up inner masonry wythe or sheathing at least 14 inches.
4. Secure flexible fabric flashing to wall with continuous termination bar and apply sealant across top of termination bar.

3.08 VERTICAL MASONRY REINFORCEMENT

A. Reinforcement: Size and place vertical masonry reinforcement to comply with TMS 402/602 requirements and as indicated on Drawings.

B. Place and consolidate grout fill without displacing reinforcing.

3.09 GROUTING

A. Reinforced Hollow Unit Masonry: Keep vertical cores to be grouted clear of mortar, including bed area of first course.

B. Perform grouting by means of high-lift technique, except in locations that mandate use of low-lift grouting technique.
1. Do not use high-lift grouting where size of cavities mandates use of fine grout.

C. Low-Lift Grouting:
1. Limit height of pours to 12 inches.
2. Limit height of masonry to 16 inches above each pour.
3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

D. High-Lift Grouting:
1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
2. Clean out masonry cells and other cavities to be grouted by high pressure water spray or compressed air. Remove debris, allow to dry, and inspect before sealing cleanout openings.
3. Hollow Masonry: Limit lifts to maximum 4 feet and pours to maximum height of 24 feet.
4. Place grout for spanning elements in single, continuous pour.

3.10 GROUTED COMPONENTS

A. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

B. Place and consolidate grout fill without displacing reinforcing.

C. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.11 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.
B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
    1. Refer to Section 07 9200 - Joint Sealants for sealant installation.

3.12 BUILT-IN WORK

A. As work progresses, install built-in glazed frames, anchor bolts, plates, and reglets and other items to be built into the work and furnished under other sections.
B. Install built-in items plumb, level, and true to line.
C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
    1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

3.13 TOLERANCES

A. Dimensions and Locations of Elements:
    1. Location of elements in plan; do not vary from that indicated on Drawings by more than:
        a. Plus or minus 1/2 inch.
    2. Dimensions in cross section; do not vary from that indicated on Drawings by more than:
        a. Minus 1/4 inch.
        b. Plus 1/2 inch.
B. Maximum Variation from Alignment of Columns and Pilasters: 1/4 inch.
C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.
H. Lines and Levels:
    1. Maximum variation from level:
        a. Includes, but is not limited to, the following:
            1) Lintels.
            2) Sills.
            3) Parapets.
            4) Reveals.
            5) Other conspicuous lines.
        b. Do not vary from level by more than:
            1) 1/4 inch in 20 feet.
            2) 1/2 in in 40 feet or more.
    2. Maximum variation from plumb:
        a. Includes, but is not limited to, the following:
            1) External corners.
            2) Control and expansion joints.
            3) Reveals.
            4) Other conspicuous lines.
        b. Do not vary from plumb by more than:
            1) 1/4 inch in 20 feet.
            2) 1/2 in in 40 feet or more.
I. Mortar Joint Thickness: Do not vary thickness indicated by more than plus or minus 1/8 inch.

3.14 CLEANING

A. Protect surrounding elements and finishes from damage due to cleaning procedures.

B. Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 10 feet away, subject to Architect's approval.
C. Remove excess mortar and mortar droppings.
D. Clean soiled surfaces with cleaning solution.
E. Apply masonry cleaners to masonry surfaces according to manufacturer's written instructions; use brush or spray application.
    1. Periodically during rinsing, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
        a. Repeat rinsing until tested pH of water runoff is between 6.7 and 7.5.

3.15 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 2000

SECTION 04 7200 - CAST STONE MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Decorative elements.
2. Mortar materials.
3. Accessories.

B. Related Requirements:
1. Section 04 2000 "Unit Masonry."

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, 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.
1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Initial Selection: For colored mortar.

D. Samples for Verification:
1. For each color and texture of cast stone required, 4 inches square in size.
2. For each trim shape required, 4 inches in length.
3. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.

E. Full-Size Samples: For each shape of cast stone unit required.
1. Make available for Architect's review at Project site.
2. Make Samples from materials to be used for units used on Project immediately before beginning production of units for Project.
3. Approved Samples may be installed in the Work.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.
1. Include copies of material test reports, indicating compliance of cast stone with ASTM C1364.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C1364.
1. Provide test reports based on testing within previous six months.

1.04 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 CSI or APA or PCI for Group A, Category AT.

B. Furnish cast stone for installation in mockups specified in Section 04 2000 "Unit Masonry."

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Build mockup for cap installation.
      a. Size: Full size.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.

B. Pack, handle, and ship cast stone units in suitable packs or pallets.
   1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units if required, using dollies with wood supports.
   2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

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

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

1.06 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Cast Stone: Obtain cast stone units from single source from single manufacturer.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.02 CAST STONE MATERIALS

A. General: Comply with ASTM C1364.

B. Portland Cement: ASTM C150/C150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C114. Provide natural color or white cement as required to produce cast stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C33/C33M; gradation and colors as needed to produce required cast stone textures and colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C33/C33M, gradation and colors as needed to produce required cast stone textures and colors.

E. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Use only admixtures specified or approved in writing by Architect.
1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
3. Air-Entraining Admixture: ASTM C260/C260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
4. Water-Reducing Admixture: ASTM C494/C494M, Type A.
5. Water-Reducing, Retarding Admixture: ASTM C494/C494M, Type D.
6. Water-Reducing, Accelerating Admixture: ASTM C494/C494M, Type E.

G. Reinforcement:
1. Deformed steel bars complying with ASTM A615/A615M, Grade 40. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.
   a. Epoxy Coating: ASTM A775/A775M.
   b. Galvanized Coating: ASTM A767/A767M.
2. Plain-Steel, Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
3. Galvanized-Steel, Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.
4. Fiber Reinforcement: ASTM C1116/C1116M.

H. Embedded Anchors and Other Inserts: Fabricated from steel complying with ASTM A36/A36M and hot-dip galvanized to comply with ASTM A123/A123M.

2.03 CAST STONE UNITS

A. Cast Stone Units: Comply with ASTM C1364.
1. Units are manufactured using the manufacturer's selected method.
2. Trim units including wall caps.

B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

C. Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.

2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

D. Cure Units as Follows:
1. Cure units in enclosed, moist curing room at 95 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F 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 or above.
   b. No fewer than seven days at mean daily temperature of 50 deg F or above.

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

F. Colors and Textures: As selected by Architect from manufacturer's full range.

2.04 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 04 2000 "Unit Masonry."

B. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

C. Hydrated Lime: ASTM C207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Masonry Cement: ASTM C91/C91M.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Colored Portland Cement-Lime Mix:
2. Colored Masonry Cement:
3. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
4. Pigments do not exceed 10 percent of portland cement by weight.
5. Pigments do not exceed 5 percent of masonry cement or mortar cement by weight.

H. Preblended Dry Mortar Mix: Packaged blend made from portland cement and hydrated lime masonry cement or mortar cement, sand, mortar pigments, water repellents, and admixtures and complying with ASTM C1714/C1714M.
1. Preblended Dry Portland Cement Mortar Mix:
2. Preblended Dry Masonry Cement Mortar Mix:

I. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

J. Water: Potable.

2.05 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from steel complying with ASTM A36/A36M and hot-dip galvanized to comply with ASTM A123/A123M.

B. Dowels: 1/2-inch-diameter round bars, fabricated from Type 316 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666.

C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.06 MORTAR MIXES

A. Comply with requirements in Section 04 2000 "Unit Masonry" for mortar mixes.

B. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime masonry cement or mortar cement mortar unless otherwise indicated.

C. Comply with ASTM C270, Proportion Specification.
1. For setting mortar, use Type S.
2. For pointing mortar, use Type N.

D. Preblended dry mortar mix complying with ASTM C1714/C1714M and capable of producing mortar strength as indicated in ASTM C270.
1. For setting mortar, use Type S.
2. For pointing mortar, use Type N.

E. 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.
1. Pigments do not exceed 10 percent of portland cement by weight.
2. Pigments do not exceed 5 percent of masonry cement or mortar cement by weight.
3. Mix to match Architect's sample.
4. Application: Use pigmented mortar for exposed mortar joints.

F. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Architect's sample.
2. Application: Use colored-aggregate mortar for exposed mortar joints.

2.07 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to sample and test cast stone units according to ASTM C1364.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.02 SETTING CAST STONE IN MORTAR

A. Set cast stone as indicated in TMS 604.

B. Install cast stone units to comply with requirements in Section 04 2000 "Unit Masonry."

C. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
   1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
   2. Coordinate installation of cast stone with installation of flashing specified in other Sections.

D. Wet joint surfaces thoroughly before applying mortar or setting in mortar.

E. Set units in full bed of mortar with full head joints unless otherwise indicated.
   1. Set units with joints 3/8 to 1/2 inch wide unless otherwise indicated.
   2. Build anchors and ties into mortar joints as units are set.
   3. Fill dowel holes and anchor slots with mortar.
   4. Fill collar joints solid as units are set.
   5. Build concealed flashing into mortar joints as units are set.
   6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
   7. Keep joints at shelf angles open to receive sealant.

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

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

H. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

I. Rake out joints for pointing with sealant to depths of not less than 3/4 inch. Scrub faces of units to remove excess mortar as joints are raked.

J. Point joints with sealant to comply with applicable requirements in Section 07 9200 "Joint Sealants."

1. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

K. Provide sealant joints at head joints of 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. Build in compressible foam-plastic joint fillers where indicated.
3. Form joint of width indicated, but not less than 1/2 inch.
4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 9200 "Joint Sealants."

3.03 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

A. Set cast stone as indicated in TMS 604.

B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.

C. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.

D. Fill anchor holes with sealant.
1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.

E. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.

F. 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. Do not begin sealant installation until temporary shims and spacers are removed.
1. Form open joint of width indicated, but not less than 1/2 inch.

G. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

H. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 9200 "Joint Sealants."

3.04 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2 inch maximum.

B. Variation from Level: Do not exceed 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2 inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches 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, except where variation is due to warpage of units within tolerances specified.

3.05 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 as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
   3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
   5. Clean cast stone by methods described in Cast Stone Institute Technical Bulletin #39.
   6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 04 7200

SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Steel railings.

B. Related Requirements:
   1. Section 09 9113 "Exterior Painting".

1.02 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.03 ACTION SUBMITTALS

A. Product Data:
   1. Shop primer.
   2. Intermediate coats and topcoats.
   3. Nonshrink, nonmetallic grout.
   4. Metal finishes.
   5. Paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

D. Samples for Verification: For each type of exposed finish required.
   1. Sections of each distinctly different linear railing member, including handrails, top rails, and posts, including finish.
   2. Fittings and brackets.
   3. Assembled Sample of railing system, made from full-size components, including top rail, and post. Sample need not be full height.
      a. Show method of connecting and finishing members at intersections.

E. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For delegated design professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

E. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.07 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails and Top Rails of Guards:
a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.02 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.03 STEEL RAILINGS

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M, Type 5.

C. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
   1. Provide galvanized finish for exterior installations and where indicated.

D. Plates, Shapes, and Bars: ASTM A36/A36M.

2.04 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
   1. For railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primers: Provide primers that comply with Section 09 9113 "Exterior Painting."

E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

G. Intermediate Coats and Topcoats: Provide products that comply with Section 09 9113 "Exterior Painting."

H. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

I. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

J. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assembles railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
   1. Clearly mark units for reassembly and coordinated installation.
   2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.
   1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
   2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

I. Form changes in direction as follows:
1. As detailed.
2. By bending.
3. By flush bends.
4. By radius bends of radius indicated.
5. By bending to smallest radius that will not result in distortion of railing member.

J. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

M. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.06 STEEL AND IRON FINISHES

A. Galvanized Railings:
1. Hot-dip galvanize exterior indicated steel railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner and as follows.
1. Comply with SSPC-SP 16.

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
   1. Shop prime uncoated railings with primers specified in Section 09 9113 "Exterior Painting" unless zinc-rich primer is indicated.

E. Shop-Painted Finish: Comply with Section 09 9113 "Exterior Painting."
   1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.02 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.
   1. Fit exposed connections together to form tight, hairline joints.
   2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
   3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
   4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

3.03 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

3.04 ANCHORING POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Cover anchorage joint with flange of same metal as post, attached to post with setscrews.

3.05 REPAIR

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9113 "Exterior Painting."

3.06 CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.07 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 5213

SECTION 06 1000 – ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Framing with dimension lumber.
   2. Framing with engineered wood products.
   3. Rooftop equipment bases and support curbs.
   4. Wood blocking[, cants,] and nailers.
   5. Wood furring[and grounds].
   6. Wood sleepers.

PART 2 PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Maximum Moisture Content of Lumber: [19 percent] [15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness] [19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness] unless otherwise indicated.

B. 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.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. 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 floor plates that are installed over concrete slabs-on-grade.

2.03 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

B. Framing Other Than Non-Load-Bearing Partitions: No. 2 grade.
   1. Species:
   2. Hem-fir (north); NLGA.

2.04 ENGINEERED WOOD PRODUCTS

A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.

PART 3 EXECUTION

3.01 INSTALLATION

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

E. Do not splice structural members between supports unless otherwise indicated.
F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
G. 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. ICC-ES evaluation report for fastener.

3.02 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

SECTION 06 1600 – SHEATHING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Roof sheathing.

1.02 ACTION SUBMITTALS

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

PART 2 PRODUCTS

2.01 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet 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."

2.02 ROOF SHEATHING

A. Plywood Sheathing: Exposure 1 sheathing.
B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1 sheathing.

2.03 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. For roof sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
   2. For roof sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
   2. ICC-ES evaluation report for fastener.
D. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.02 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
B. Fastening Methods: Fasten panels as indicated below:
   1. Wall and Roof Sheathing:
      a. Nail to wood framing.
      b. Screw to cold-formed metal framing.
      c. Space panels 1/8 inch apart at edges and ends.

END OF SECTION

SECTION 06 1753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Wood roof trusses.

1.02 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.
B. Shop Drawings: Show fabrication and installation details for trusses.
   1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
   2. Indicate sizes, stress grades, and species of lumber.
   3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
   4. Indicate locations, sizes, and materials for 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.
C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.03 INFORMATIONAL SUBMITTALS

A. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.
B. Evaluation Reports: For the following, from ICC-ES:
   1. Metal-plate connectors.
   2. Metal truss accessories.

1.04 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer 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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.
B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1.
C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.02 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (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. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

2.03 METAL CONNECTOR PLATES

A. General: Fabricate connector plates to comply with TPI 1.
B. Hot-Dip 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); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

2.04 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
   2. 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.
B. Nails, Brads, and Staples: ASTM F 1667.

2.05 METAL FRAMING ANCHORS AND ACCESSORIES

A. Allowable design loads, as published by manufacturer, shall comply with 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 coating designation.

2.06 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

3.01 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 metal framing anchors 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.
H. Install bracing to comply with Section 061000 "Rough Carpentry."
   1. Install wood trusses within installation tolerances in TPI 1.
I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
J. Replace wood trusses that are damaged or do not comply with requirements.

END OF SECTION

SECTION 07 1900 - WATER REPELLENT ACRYLIC PENETRATING SEALER - CANYON TONE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water repellents applied to exterior and interior, masonry, stone, and concrete surfaces.

1.02 REFERENCE STANDARDS

A. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2025.

B. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2021.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

D. Manufacturer's Qualification Statement.

E. Installer's Qualification Statement.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements for additional provisions.
2. Extra Water Repellent Material: Two gallons of type installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least 5 years of documented experience

1.06 MOCK-UPS

A. Prepare representative surface 36 by 36 inches in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. Locate where directed.

C. Mock-up may remain as part of work.

1.07 FIELD CONDITIONS

A. Protect liquid materials from freezing.

B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a 10 year period after Date of Substantial Completion.

C. Provide 10 year manufacturer warranty for the following.

1. Product used will act as a water-repellent for the full warranty period.
2. Product used will not peel or flake for the full warranty period.
3. Product used will have excellent color retention and uniformity for the full warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Water Repellent Acrylic Pentrating Sealer
   1. United Coatings; Canyon Tone Stain: www.gaf.com.

2.02 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
   2. Number of Coats: Two.
   3. Moisture Absorption When Applied to Masonry: 8 percent, maximum, when tested in accordance with ASTM C140/C140M using masonry sample completely coated with water repellent.
   4. Moisture Absorption When Applied to Concrete: 8 percent, maximum, when tested in accordance with ASTM C642 concrete sample completely coated with water repellent.
   5. Maintains dry appearance when wetted.
   6. Water-based acrylic that reacts chemically with concrete and masonry.

B. Water-repellent stain shall be UNITED COATINGS' "CANYON TONE STAIN", meeting the following minimum requirements:
   1. Solids by volume shall be a maximum of 33% (±2) [ASTM D2697]
   2. Weight per gallon shall be 10.6 lbs (4.8 kg) (±.2) [ASTM D1475]
   3. Dry time shall be 15 minutes @ 75°F (24°C), 50% R.H. [ASTM D1640]
   4. Cure time shall be 1 hour @ 75°F (24°C), 50% R.H. [ASTM D1640]
   5. Gloss (Angular Reflectance) shall be 4 @ 60°Gardner [ASTM D523]
   6. Adhesion to concrete shall be a minimum of 300 lbs./sq. in. (2,069 MPa) [ASTM D3359]
   7. Temperature limits for service conditions shall range from -70° F to 200° F (-64°C to 93°C)
   8. Toning pigments shall be inorganic oxides
   9. Stain shall have a minimum 10-year history of successful performance under weather conditions similar to those encountered at the project site.

2.03 COLOR

A. Color of the stain shall be clear, as selected by the Architect.

2.04 PERFORMANCE REQUIREMENTS

A. Resistance to dirt or soil collection: Treated specimen shall meet the following requirements after 12 months concentrated weather exposure in southeast (high humidity) environment when tested in accordance with ASTM D3719:
   1. Dirt collection index of 90% minimum
   2. No fungal growth

B. Resistance to concentrated sunlight: Color retention and ultraviolet resistance of the treated specimen shall meet the following requirements after 18,577 mega joules of radiation when tested in accordance with ASTM G90 on a Q-Track sunlight concentrator:
   1. No cracking visible under 45X magnification
   2. Instrumental color change of less than .90 CIE units
   3. Instrumental gloss change of less than 1 unit tested @ 60°Gardner

C. Resistance to Accelerated Weathering: Color retention and ultraviolet resistance of the treated specimen shall meet the following requirements after 1,500 hours of testing in accordance with ASTM G154 in a QUV cabinet:
   1. Color Retention: Within five (5) N.B.S. (National Bureau of Standards) units when tested in accordance with ASTM D2244; or shall show no appreciable change when tested in accordance with ASTM D1729.Inspection is compared to unweathered specimen.
   2. Ultraviolet Resistance: No chalking or flaking when tested in accordance with ASTM D659 and D722.

D. Resistance to Salt Spray: Color retention and degree of efflorescence of the treated specimen shall meet thefollowing requirements after 500 hours of testing in accordance with ASTM B117 in a Harshaw Salt Spray Cabinet:
   1. Color Retention: Within five (5) N.B.S. (National Bureau of Standards) units when tested in accordance with ASTM D2244; or shall show no appreciable change when tested in accordance with ASTM D1729 with ASTM D2244; or shall show no appreciable change when tested in accordance with ASTM D1729 Inspection is compared to unweathered specimen.
   2. Degree of Efflorescence: Specimen shall exhibit no efflorescence when tested in accordance with ASTM D2831.

E. Resistance to Sulfide Staining: No discoloration after 15 minutes immersion in saturated Hydrogen Sulfide gas solution when tested in accordance with ASTM D1712. Compare with control specimen not exposed to Hydrogen Sulfide gas solution.

F. Resistance to Chemical Reagents: Specimen shall exhibit none or slight color change and no softening or deterioration after 7 days immersion in the following chemicals: Ammonium Hydroxide - 10%; Sodium Hydroxide - 10%; Mineral Spirits, KB value 38. Inspection is compared to specimen not exposed to chemical reagents.

G. Verification of Minimum 10-Year Exposure to Appropriate Climate: Stain shall have been in use in a similar climatic region 10 years or more and show no sign of fading, peeling or flaking. Supply project locations exceeding 10 years of service.

H. Moisture Vapor Transmission: Must allow moisture from building interior to pass through the substrate and stain with a perm rating of 10 (±2) when tested in accordance with ASTM E96.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

A. Protection of Adjacent Work:
   1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
   2. Protect adjacent surfaces not intended to receive water repellent.

B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

C. Remove loose particles and foreign matter.

D. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.

E. Scrub and rinse surfaces with water and let dry.

F. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.

B. Water-repellent stain shall be spray-applied using conventional or airless spray equipment in two (2) separate applications in strict accordance with the Manufacturer's printed application instructions and precautions, copies of which shall be at the jobsite. The first application shall achieve an in-depth penetrating color base. The second application shall achieve color uniformity, aesthetic satin tone, and water repellency. Material shall be applied using methods and equipment as recommended by the stain Manufacturer.Applicators shall be required to wear chemical respirators in accordance with OSHA requirements during application. Should jobsite or environmental conditions prohibit spray application, the stain may be applied by roller, taking care so as to not exceed the recommended application rate.
C. The Applicator shall apply a field test on a small inconspicuous area of the actual building surface to determine the best absorption rate to achieve color uniformity, as well as to determine suitability of the application technique.
D. Apply water repellent to the following:
    1. Cast stone masonry.
    2. Ground-face block.
    3. Split-faced block
    4. Other materials as indicated.
E. Apply at rate recommended by manufacturer, continuously over entire surface.
F. Apply two coats, minimum.
G. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.
H. If unevenness in color, lines from work termination or scaffolding, etc. exist, the Architect or Owner may have all such surfaces reapplied at the Contractor's expense. Reapplication, if required, shall be carried to a natural termination point.

END OF SECTION 07 1900

SECTION 07 2100 - THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Cavity wall insulation specified as part of the masonry.

1.03 REFERENCE STANDARDS

A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

C. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.

D. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Product Coordination and Limitations: Provide products that when combined with materials and components of other sections, form exterior wall assemblies as detailed on Drawings, that comply with NFPA 285 testing and acceptance criteria.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. NFPA 285 Documentation: For each product, submit documentation listing compatible materials and components that when used together in wall assemblies as detailed on Drawings, comply with NFPA 285 testing and acceptance criteria.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than 5 years of documented experience.

1.07 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
4. Formaldehyde Content: Zero.
5. Thermal Resistance: R-value of 30 unless otherwise indicated.
6. Thickness: To achieve R value indicated inch,.
7. Facing: Unfaced, Type 1.
8. Products:
   a. CertainTeed Corporation; CertaPro AcoustaTherm Batts: www.certainteed.com.
   b. Knauf Insulation; EcoBatt Insulation with ECOSE Technology: www.knaufinsulation.com.

c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.owenscorning.com.
d. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Sheet Vapor Retarder: Black polyethylene film for above grade application, 10 mil, 0.010 inch thick.

B. Tape: Polyethylene self-adhering type, 3 inch (75 mm) wide.
1. Products:
a. DiversiFoam Products: Or Equal; www.diversifoam.com
b. Dow Building Solutions, Dow Chemical Company; Weathermate Construction Tape: www.dow.com.
c. Kingspan Insulation LLC; GreenGuard Seam Tape: www.trustgreenguard.com.
d. Owens Corning; JointSealR Foam Joint Tape: www.owenscorning.com.
e. Substitutions: See Section 01 6000 - Product Requirements.

C. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
1. Application: Sealing of interior circular penetrations, such as pipes or cables.
2. Width: Are required for application.
3. Temperature Resistance: Range of minus 40 to 212 degrees F.
4. Products:
a. SIGA Cover Inc; SIGA-Rissan: www.siga.swiss/global_en/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

D. Self-Adhered Transition Flashing: Multipurpose, self-adhered flashing with modified butyl adhesive, polyester fiber top sheet, and polypropylene interlayer.
1. Application: Primerless adhesion for use as through-wall flashings and wall transitions to roof and below-grade systems.
2. Thickness: 45 mil, 0.045 inch, nominal.
3. Size: 6 inches wide, in rolls 75 feet long.
4. Products:
a. DuPont de Nemours, Inc; DuraGard CM Transition Flashing: building.dupont.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

E. Adhesive: Type recommended by insulation manufacturer for application.

F. Formed-in-Place Foam Sealant: Two-component polyurethane sealant.
1. Gun-applied and straw-applied products.
2. Thermal Resistance (R) Value: 6.5 per inch.
3. Maximum gap width: 3 inches.
4. Manufacturer:
a. Dow Building Solutions, Dow Chemical Company; Froth-Pak Foam Sealant: www.dow.com.
b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

C. Verify board insulation materials are dry, clean, and ready to receive foam-in-place sealants.

3.02 INSTALLATION - GENERAL

A. Install according to insulation manufacturers instructions.

B. Use sizes, thickness, and types as indicated on Drawings.

C. Fit insulation snugly against abutting insulation and building construction without gaps.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.
B. Install in Attic spaces without gaps or voids. Do not compress insulation.
C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
E. Where extra support is needed, retain insulation batts in place with wire mesh secured to framing members or adjacent construction.

3.04 INSULATION AT MISCELLANEOUS VOIDS

A. Install one or more of the following:
   1. Glass fiber batt insulation.
   2. Formed-in-place foam sealant.
B. Install insulation to neatly fit spaces; fill voids completely without compressing insulation.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 2100

SECTION 07 2500 - WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-resistive barriers.

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Weather barrier installed in conjunction with batt insulation.

B. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

1.03 DEFINITIONS

A. Weather Barriers: Materials or assemblies forming water-resistive barriers, air barriers, vapor retarders, or combination of one or more assemblies.

B. Water-Resistive Barriers: Materials or assemblies installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly.

1.04 REFERENCE STANDARDS

A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2025.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2025.

C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

E. ASTM E2556/E2556M - Standard Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment; 2010 (Reapproved 2022).

F. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; 2016, with Editorial Revision (2021).

G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIERS

A. Description: Materials installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly. Primary materials include mechanically applied sheets; accessory materials include flashings and seam tapes.

B. Water-Resistive and Air Barrier, Multilayers: Outer layers of nonwoven, spunbonded polypropylene with vapor permeable, watertight polymeric middle layer.

1. Air Permeance: 0.0011 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 28 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 3 months of weather exposure.
4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
5. Seam and Perimeter Tape: As recommended by sheet manufacturer.
6. Products:
   a. SIGA Cover Inc; SIGA-Majvest 200: www.siga.swiss/global_en/#sle.
   b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Seal and Perimeter Tapes: As recommended by water-resistive barrier manufacturer.
B. Flashings and Sealants: As recommended by water-resistive barrier manufacturer for application.
C. Building Insulation: See Section 07 2100.
D. Metal Flashings: See Section 07 6200.
E. Flexible Flashing: Self-adhering sheet flashing complying with ASTM D1970/D1970M; waive slip resistance requirement if not installed on roof.
   1. Width: 3 inches.
   2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.
   3. Products:
      a. DuPont de Nemours, Inc; VersaFlange: www.dupont.com/building/#sle.
      b. W. R. Meadows, Inc; Air-Shield Butyl Flashing: www.wrmeadows.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.
F. Preformed Transition Membrane: Semi-rigid silicone or polyester composition, tapered edges, and tear resistant.
   1. Products:
      a. Dow; DOWSIL Silicone Transition Strip and System: www.dow.com/en-us/#sle.
      b. Henry, a Carlisle Company; Moistop Corner Shield: www.henry.com/#sle.

2.03 FASTENERS

A. Fasteners for Attaching Water-Resistive Barriers to Substrates: As indicated on drawings.
B. Air- and Moisture-Sealing Insulation Fasteners: Preassembled fastener units consisting of sealing washer, screw, and gasketing tube.
   1. Thread and tip types as required for substrate material.
   2. Products:
      a. TruFast Walls, a Division of Altenloh, Brinck & Co. US, Inc; Grip-Deck TubeSeal: www.trufastwalls.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.
C. Self-Sealing Washers: Solid plastic, 2 inch diameter washers; seals building-wrap air barriers against air penetration.
   1. Products:
      a. TruFast Walls, a Division of Altenloh, Brinck & Co. US, Inc; Thermal-Grip Flat Washer: www.trufastwalls.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

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

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

3.04 PROTECTION

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

END OF SECTION 07 2500

SECTION 07 3113 - ASPHALT SHINGLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt shingle roofing.
B. Underlayment.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Roof sheathing.
B. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings and drip edges.
C. Section 07 7123 - Manufactured Gutters and Downspouts.
D. Section 07 7100 - Roof Specialties: Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2025.
B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2025.
C. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2020.
D. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules; 2025.
E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement; 2025.
F. ASTM D4869/D4869M - Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing; 2016a (Reapproved 2025).
G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
H. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2020a.
I. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2021.
J. NRCA (RM) - The NRCA Roofing Manual; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating material characteristics.
C. Shop Drawings: For metal flashings, indicate specially configured metal flashings.
D. Samples:
    1. Underlayment: Submit three 4 inch by 4 inch samples of each type.
    2. Shingles: Submit three samples of each shingle color indicating color range and finish texture/pattern.
E. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01 6000 - Product Requirements, for additional provisions.
    2. Extra Shingles: 100 sq ft of each type and color.

1.05 MOCK-UP

A. Provide mock-up of 100 sq ft, including underlayment, shingles, associated flashings, and ridge vent.
B. Locate where directed.
C. Mock-up may remain as part of the Work.

1.06 FIELD CONDITIONS

A. Do not install shingles or underlayment when surface or ambient air temperatures are below 45 degrees F.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Material Warranty: Provide 40 year shingle material warranty, from date of Substantial Completion, prorated, with first five years nonprorated.

C. Wind-Speed Warranty: Provide five warranty, from date of Substantial Completion, against shingle blow-off or damage caused by wind speeds up to Warranted Wind Speed specified.

PART 2 PRODUCTS

2.01 ASPHALT SHINGLES

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
   1. Fire Resistance: Class A, complying with ASTM E108.
   2. Wind Resistance: Class F, when tested in accordance with ASTM D3161/D3161M.
   3. Warranted Wind Speed: Not greater than 110 mph.
   4. Self-sealing type.
   5. Style: Laminated overlay.
   6. Color: As selected by Architect.

B. Specialty Shingles: Provide starter shingles and hip and ridge shingles.

C. Products:
   1. CertainTeed Corp., Saint-Gobain: Landmark PRO: www.certainteed.com.
   2. GAF; Timberline HD: www.gaf.com.
   3. Owens Corning; Duration: www.owenscorning.com.
   4. TAMKO Building Products, Inc.; Heritage Premium: www.tamko.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SHEET MATERIALS

A. Underlayment: Self-adhering rubber-modified asphalt sheet conforming to ASTM D1970/D1970M; 40 mil total thickness; with strippable release film and granular top surface.
   1. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
   2. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
   3. Water Vapor Permeance: 0.1 perms, when tested in accordance with ASTM E96/E96M, Procedure A (desiccant method).
   4. Liquid Water Transmission: Passes ASTM D4869/D4869M.
   5. Products:
      a. CertainTeed Corp., Saint-Gobain: WinterGuard Granular: www.certainteed.com.
      b. GAF; WeatherWatch Mineral-Surfaced Leak Barrier: www.gaf.com.
      c. GCP; Grace Ice & Water Shield Roofing Underlyament: www.gcpat.com
      d. Owens Corning; WeatherLock G: www.owenscorning.com.
      e. TAMKO Building Products, Inc.; Moisture Guard: www.tamko.com.
      f. Substitutions: See Section 01 6000 - Product Requirements.

B. Underlayment: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D226/D226M, Type II ("No.30").

2.03 ACCESSORIES

A. Roofing Nails: Standard round wire shingle type, galvanized steel or stainless steel, minimum 3/8 inch head diameter, 12 gage, 0.109 inch nail shank diameter, 1-1/2 inch long and conforming to ASTM F1667.

B. Plastic Cement: ASTM D4586/D4586M, asphalt roof cement.

2.04 METAL FLASHINGS

A. Refer to Section 07 6200 - Sheet Metal Flashing and Trim.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

A. Broom clean deck surfaces before installing underlayment or eave protection.

3.03 INSTALLATION - UNDERLAYMENT

A. General: Install underlayment according to manufacturer's instructions and as specified.
   1. Underlayments shall weather lap metal drip edges.

B. Install self-adhering sheet underlayment with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer.
   1. Install without wrinkles; overlapping edges shall be sealed tightly without gaps.
   2. Locations:
      a. Eaves: Extend from edges of eaves, 24 inches beyond interior face of exterior wall.
      b. Rakes: Extend from edges of rakes, 24 inches beyond interior face of exterior wall.
      c. Valleys: Extend from lowest to highest point 18 inches on each side.
      d. Hips: Extend 18 inches on each side.
      e. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent opening.
      f. Openings and Penetrations: Extend beyond penetrating element 18 inches, and return vertically against penetrating element not less than 4 inches.
      g. Sidewalls: Extend beyond penetrating element 18 inches, and return vertically against sidewall not less than 4 inches.
      h. Roof Slope Transitions: Extend 18 inches on each roof slope.

C. Install roofing felt underlayment parallel to roof deck with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer. Secure with roofing nails.
   1. Lap sides of felt underlayment over self-adhering sheet underlayment not less than 4 inches in direction that sheds water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.
   2. Install without wrinkles.
   3. Locations:
      a. All areas not covered by self-adhering sheet underlayment.

3.04 INSTALLATION - METAL FLASHING AND ACCESSORIES

A. Refer to Section 07 6200 - Sheet Metal Flashing and Trim.

3.05 INSTALLATION - SHINGLES

A. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
   1. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
   2. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.

B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.

C. At eaves, project first course of shingles 3/4 inch beyond edge of roof sheathing and metal drip edges..

D. At rakes, extend shingles 1/2 inch beyond edge of roof sheathing and metal drip edges

E. Extend shingles on one slope across valley and fasten, trim shingles from other slope 2 inches from valley center line to achieve closed cut valley, and concealing valley protection.
   1. Set trimmed asphalt shingles in a 3 inch wide bed of plastic cement.

F. Cap hips and ridges with individual shingles, maintaining 5 inch weather exposure, and place to avoid exposed nails.
   1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.
G. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.
H. Complete installation to provide weather tight service.

3.06 PROTECTION

A. Do not permit traffic over finished roof surface.

END OF SECTION 07 3113

SECTION 07 4213 - SOFFIT PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for soffits, with related flashings and accessory components.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used.
C. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.
D. Samples: Submit three samples of wall panel and soffit panel, 12 inch by 12 inch in size illustrating finish color, sheen, and texture.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years of documented experience.
B. Installer Qualifications: Company specializing in installing products of the type specified in this section with minimum 5 years of documented experience and approved by manufacturer.

1.05 MOCK-UP

A. Construct mock-up, 10 feet long by 10 feet wide; include panel and soffit system, attachments to building frame, associated vapor retarder and air seal materials, weep drainage system, sealants and seals, related insulation in mock-up.
B. Locate where directed by Architect.
C. Mock-up may remain as part of the Work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
B. Correct defective work within a twenty year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
C. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for metal wall panels.

PART 2 PRODUCTS

2.01 MANUFACTURED METAL PANELS - GENERAL

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
    1. Provide exterior panels and soffit panels.
    2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.

3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
7. Corners: Factory-fabricated in one continuous piece with minimum 2 inch returns.

2.02 SOFFIT PANELS

A. Soffit Panels:
1. Profile: 2 segment, v-groove, flat panels.
2. Panel Coverage (Width): 12 inches.
3. Panel Depth: 1/2 inch.
4. Ventilation: Half panel.
5. Material: Precoated aluminum sheet, 20 gauge, 0.032 inch minimum thickness.
6. Side Joints: Interlocking.
7. Fasteners: Concealed.
8. Panel Surface: Smooth.
9. Color: To match Architect's sample.
10. Basis-of-Design: Elevate; UNA-CLAD UC-750: www.holcimelevate.com. Provide either the named product or a comparable product by one of the following:
    a. ATAS International, Inc.; Wind-Lok Soffit Panels: www.atas.com.
    b. Merchant & Evans, Inc.; PS-8b, 150-12 Soffit Panels: www.ziprib.com.
    c. Petersen Aluminum Corporation; PAC-750 Soffit: www.pac-clad.com.
    d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MISCELLANEOUS

A. Internal and External Corners: Same material, thickness, and finish as soffit panels; profile to suit system;shop cut and factory mitered to required angles.
B. Trim, Closure Pieces, Caps, and Flashings: Same material, thickness and finish as soffit panels; brake formed to required profiles.
C. Anchors: Galvanized steel or Stainless steel.

2.04 MATERIALS

A. Precoated Aluminum Sheet: ASTM B209 (ASTM B209M), 3105 alloy, O temper, smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.05 FINISHES

A. Fluoropolymer Coil Coating System: Manufacturer's standard multi-coat aluminum coil coating system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of coil coated aluminum surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch.
1. Color: Custom color to match Architect's sample.

2.06 ACCESSORIES

A. Concealed Sealants: Non-curing butyl sealant or tape sealant.
B. Exposed Sealants: Refer to Section 07 9200 - Joint Sealants.
C. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Exposed fasteners same finish as panel system.
D. Field Touch-up Paint: As recommended by panel manufacturer.
E. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that structural substrate is ready to receive panel system.
B. Verify that weather barrier has been installed over substrate completely and correctly.

3.02 INSTALLATION

A. Install panels on soffits in accordance with manufacturer's instructions.
B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
C. Fasten panels to structural supports; aligned, level, and plumb.
D. Lap panel ends minimum 2 inches.
E. Provide expansion and control joints where indicated.

3.03 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
B. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch.

3.04 CLEANING

A. Remove site cuttings from finish surfaces.
B. Remove protective material from wall panel surfaces.
C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION 07 4213

SECTION 07 4646 - FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.
   1. Trim

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers.
B. Section 07 6200 - Sheet Metal Flashing and Trim.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Characteristics and storage and handling requirements.
C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, support rails, and anchorage methods.
D. Samples: Two of each siding panel, 12 by 12 inches, illustrating color, pattern, and texture.
E. Manufacturer's Instructions: Indicate installation.
F. Specimen warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials in manufacturer's unopened packaging with labels intact.
B. Store materials under dry and waterproof cover, in ventilated area, and elevated above grade on flat surface.

1.05 FIELD CONDITIONS

A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
B. Manufacturer Warranty: Provide 15-year manufacturer warranty for siding panels. Complete forms in Owner's name and register with manufacturer.
C. Finish Warranty: Provide 15-year manufacturer warranty against excessive finish degradation. Include provision for replacing units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nichiha USA, Inc: www.nichiha.com/#sle.
B. James Hardie .www.jameshardie.com, PH (888) 542 7343

2.02 FIBER-CEMENT TRIM

A. Description: Factory-fabricated, prefinished trim boards.
B. Performance Requirements:
   1. Material Density: Comply with ASTM C1186, Type A, Grade II.
   2. Structural Performance:
      a. Comply with ASTM E330/E330M, using test pressure 1.5 times design wind pressure, with 10-second maximum load duration.
      b. Maximum Allowable Deflection of Panel: L/180 for length (L) of span.
   3. Trim Boards: nominal 5/4 inch thickness in widths indicated
   4. Texture: Smooth
   5. Finish: Prepainted; One color selected from manufacturer's full range.

2.03 ACCESSORIES

A. Flashing: See Section 07 6200.

B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate fastened surface, minimum 1-1/4 inches.
C. Sealants: As recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify support structure meets manufacturer's requirments to receive trim.
B. Verify installation of weather barrier; see Section 07 2500.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces from damage during execution of work.

3.03 INSTALLATION

A. Install trim and support structure in accordance with manufacturer's instructions.
B. Install battens at vertical changes in direction and as detailed.

3.04 TOLERANCES

A. Wall Surface Plane: Level within 1/4 inch in 20 feet.

3.05 REPAIR

A. Touch up, repair, or replace damaged products before mm-dd-yyyy.

3.06 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
B. Clean siding in accordance with manufacturer’s instructions.

3.07 PROTECTION

A. Protect installed siding from subsequent construction operations.

END OF SECTION 07 4646

SECTION 07 5323 - EPDM MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ethylene-propylene-diene-terpolymer (EPDM) roofing assembly; fully adhered. Including, but not limited to, the following:
   1. Cover board.
   2. Walkway pads.

1.02 ABBREVIATIONS

A. EPDM: Ethylene-propylene-diene-terpolymer.

1.03 REFERENCE STANDARDS

A. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2024.
B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.
C. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015, with Editorial Revision (2022).
D. FM (AG) - FM Approval Guide; Current Edition.
E. FM 4470 - Examination Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction; 2022.
F. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2025).
G. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; 2016, with Editorial Revision (2022).
H. FM DS 1-49 - Perimeter Flashing; 2016.
I. NRCA (RM) - The NRCA Roofing Manual; 2023.
J. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated counterflashings installed under other sections.
B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating membrane materials, flashing materials, cover boards, insulation, vapor barrier, substrate board, adhesives, and fasteners.
C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, walkway pad locations, and sacrificial membrane locations.
D. Samples for Verification: Submit three samples 4 by 4 inches in size illustrating roofing membrane, cover board, insulation, vapor barrier, substrate board, and walkway pads.
E. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
F. Manufacturer's Qualification Statement.
G. Installer's Qualification Statement.
H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
I. Field Quality Control Reports.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience, and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.08 FIELD CONDITIONS

A. Do not install roofing assembly during unsuitable weather and temperatures as defined by roofing membrane manufacturer.

B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide 20 year manufacturer's system warranty where manufacturer shall repair or replace roofing system components that fail in materials or workmanship; includes failure to prevent penetration of water to include rood edge metals.

C. Installer Warranty: Provide installation warranty where Installer agrees to correct defective Work within a 2 year period after Date of Substantial Completion; includes failure to prevent penetration of water.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Assembly shall be provided by by one of the following:

1. Carlisle SynTec Systems; www.carlislesyntec.com.
2. Holcim Elevate (formerly Firestone Building Products); www.holcimelevate.com.
3. Substitutions: Not permitted.

B. Source Limitations: Obtain roof membrane from one of the named Roof Assembly manufacturers and provide related roofing assembly components from either the roof membrane manufacturer or one of the listed product manufacturers; subject to approval of roof membrane manufacturer.

2.02 ROOFING ASSEMBLY

A. Single-ply membrane roofing assembly consisting of the following:

1. EPDM single-ply roof membrane; fully adhered.
2. Cover board; fully adhered.
3. Walkway pads.

B. Performance Requirements:

1. Comply with Factory Mutual (FM) Global and FM Approvals' RoofNav Listing requirements as follows:

a. Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals FM 4450 or FM Approvals FM 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
   1) Fire/Windstorm Classification: Class 1A-90.
   2) Hail-Resistance Rating: SH.
b. Comply with the following Property Loss Prevention Data Sheets:
   1) Data Sheet FM DS 1-28: Wind Design.
   2) Data Sheet FM DS 1-29: Roof Deck Securement and Above-Deck Roof Components.
   3) Data Sheet FM DS 1-49: Perimeter Flashing.

2. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials as demonstrated by roof membrane manufacturer based on testing and field experience.

2.03 ROOF MEMBRANE

A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); internally reinforced with fabric or scrim; complying with minimum properties of ASTM D4637/D4637M.
   1. Thickness: 0.060 inch (60 mil), nominal.
   2. Color: Black.

2.04 SUBSTRATE BOARD

A. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M, fiber-reinforced gypsum board.
   1. Thickness: 1/2 inch.
   2. Size: 4 by 4, or 4 by 8 feet.
   3. Products:
      a. Georgia-Pacific Gypsum: DensDeck Prime Roof Board: www.gp.com.
      b. National Gypsum Company; DEXcell Brand FA Glass Mat Roof Board: www.nationalgypsum.com.
      c. United States Gypsum Co.; USG Securock Brand Gypsum-Fiber Roof Board; www.usg.com.
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.05 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads.
   1. Size: 30 by 30 inches.
   2. Thickness: 0.30 inch, minimum.
   3. Color: Black.
   4. Products:
      a. Carlisle SynTec Systems; Sure-Seal EPDM Pressure-Sensitive Molded Walkway Pads: www.carlislesyntec.com.
      b. Holcim Elevate (formerly Firestone Building Products); QuickSeam Walkway Pad: www.holcimelevate.com.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORIES

A. Auxiliary Materials: Provide all materials recommended by roofing assembly manufacturer for a complete and weathertight assembly.

B. Flexible Flashing Material: Same material as roofing membrane.
   1. Thickness: Same as roofing membrane unless otherwise recommended by roof membrane manufacturer.
   2. Uncured, unless otherwise recommended by roof membrane manufacturer.

C. Factory Fabricated Flashings: Same material as roofing membrane

1. Provide manufacturer's standard preformed flashings including, but not limited to, cone and vent sheet flashings, molded pipe boot flashings, and pourable sealer penetration pockets.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel bars, approximately 1 by 1/8 inch thick; with anchors.
E. Membrane and Flashing Adhesive: As recommended by membrane manufacturer.
F. Seaming Materials: Manufacturer's standard splice tape with release film.
G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals FM 4470, designed for fastening components to substrate, and acceptable to roofing system manufacturer
H. Sealants and Pourable Sealers: As recommended by membrane manufacturer.
I. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.
B. Verify deck is supported and secure.
C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
D. Verify deck surfaces are dry and free of snow or ice.
E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailing strips are in place.

3.02 WOOD DECK PREPARATION

A. Verify flatness and tightness of joints of wood decking. Fill knot holes with latex filler.
B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

3.03 INSTALLATION - GENERAL

A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
B. Do not apply roofing membrane during unsuitable weather.
C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.04 SUBSTRATE BOARD INSTALLATION

A. Install substrate boards with long joints in continuous straight lines and end joints staggered not less than 24 inches on center between board rows.
B. At metal deck, install substrate board at right angle to flutes of deck.
   1. Locate end joints over crests of metal deck.
C. Tightly butt substrate boards together.
D. Cut substrate board to fit tight around penetrations and projections.
E. Fasten substrate board to top flanges of metal deck according to roof assembly manufacturer's instructions and FM (AG) Factory Mutual requirements.

3.05 MEMBRANE INSTALLATION

A. Fully adhere membrane roofing system in accordance with manufacturer's recommendations and NRCA (RM) applicable requirements.
B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
C. Shingle joints on sloped substrate in direction of drainage.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
   1. Overlap edges and ends and seal seams by splice tape. Seal permanently waterproof.
E. At intersections with vertical surfaces:
   1. Fully adhere flexible flashing over membrane and up to nailing strips.
   2. Secure flashing to nailing strips at 4 inches on center.
F. At gravel stops, extend membrane under gravel stop and down face of wall behind gravel stop fascia. Secure with fasteners to nailing strips.
G. At copings, unless otherwise indicated, extend membrane under coping and down face of wall behind front of coping. Secure with fasteners to nailing strips.
H. Around roof penetrations, seal flanges and flashings with flexible flashing.
I. Install roofing expansion joints where indicated. Make joints watertight.
   1. Install prefabricated joint components in accordance with manufacturer's instructions.
J. Coordinate installation of roof drains and sumps and related flashings.
K. Coordinate installation of associated counterflashings installed under other sections.

3.06 SACRIFICIAL MEMBRANE INSTALLATION

A. At roof exhausts which expel vegetable oils, animal fats, and other kitchen wastes, or expel other chemicals detrimental to the roof membrane, install a sacrificial membrane over the roof membrane in an 8 foot radius, minimum, around the roof exhaust.
   1. Sacrificial membrane shall be the same material and thickness as the roof membrane.

3.07 WALKWAY PAD INSTALLATION

A. Walkway Pads: Install walkway products according to manufacturer's instructions.
B. Install walkway pads at the following locations:
   1. Perimeter of each rooftop unit.
   2. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
   3. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
   4. Top and bottom of each roof access ladder.
   5. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
   6. At downspout discharges onto roof assembly.
   7. Other locations as indicated on Drawings.
   8. As required by roof membrane manufacturer's warranty requirements.
C. Provide 6 inch clearance between adjoining pads.
D. Adhere walkway products to substrate with compatible adhesive according to walkway pad manufacturer's instructions.

3.08 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field quality control and inspection.
B. Require site attendance of roof assembly manufacturer daily during installation of the Work.
C. Final Roof Inspection: Arrange for roof assembly manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements

3.09 CLEANING

A. Clean all dirt, footprints, overspray, spillage, debris, and other construction waste materials from the roof assembly.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.10 PROTECTION

A. Protect installed roofing and flashings from construction operations.

END OF SECTION 07 5323

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed sheet metal items, including, but not limited to, the following:
   1. Flashings.
   2. Counterflashings.
   3. Drip edges.
   4. Gutters and downspouts.
   5. Precast splash blocks.
   6. Other items as indicated on Drawings.

B. Manufactured reglets.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

C. ASTM B32 - Standard Specification for Solder Metal; 2020.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. FM DS 1-49 - FM Global Property Loss Prevention Data Sheet - Perimeter Flashing; 2016.

F. NRCA (RM) - The NRCA Roofing Manual; 2023.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples:
   1. For each material and finish, submit three samples 4 by 4 inch in size illustrating metal finish color.
   2. Reglets: Submit three samples, 4 inches long, full size, of each type and finish.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 MOCK-UP

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Build mockup of typical wall flashing with counterflashing, approximately 10 feet long, including supporting construction cleats, seams, attachments and accessories.
   2. Locate where directed.
   3. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Perform work in accordance with SMACNA (ASMM) and NRCA (RM) requirements, unless more stringent requirements are indicated.

B. Sheet metal flashing and trim shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.

C. Sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

D. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standards, and by Data Sheet FM DS 1-49: Perimeter Flashing, for application, but not less than thickness of metal being secured.

E. Coordination:

1. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
2. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

2.02 SHEET MATERIALS

A. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick, minimum; plain finish shop pre-coated with fluoropolymer coating.

1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
2. Color: Two or three-coat custom color to match Architect's sample.

B. Stainless Steel: ASTM A666/A666M, Type 304 alloy, soft temper, 24 gage, 0.025 inch thick, minimum; smooth 2D (dull, cold rolled) finish.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes.

C. Fabricate cleats of same material as sheet, interlocking with sheet.

D. Form pieces in longest possible lengths.

E. Hem exposed edges on underside 1/2 inch; miter and seam corners.

F. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

G. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. Material: Pre-finished aluminum.

B. Gutters: SMACNA (ASMM) Rectangular profile; matching Style A.

1. Expansion Joints: Lap type.

C. Downspouts: Rectangular profile.

D. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM), unless otherwise indicated.

E. Anchorage Accessories: Profiled to suit gutters and downspouts.

1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
2. Gutter Supports: Continuous cleat and straps.
3. Downspout Supports: Straps.

F. Downspout Boots: Plastic, unless otherwise indicated.

G. Seal metal joints.

H. Accessories:
1. Continuous, removable leaf screen; sheet metal frame and hardware cloth screen.
2. Valley baffles.

2.05 ACCESSORIES

A. General: Provide all related materials, fasteners, hardware and accessories for a complete installation.
B. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.
1. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
2. Exposed Fasteners: Heads matching color of sheet metal using factory-applied coating.
C. Protective Backing Paint: Zinc molybdate alkyd.
D. Concealed Sealants: Non-curing butyl sealant.
E. Exposed Sealants: ASTM C920; elastomeric silicone sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
F. Solder: ASTM B32; Sn96 type for stainless steel.

2.06 DRIP EDGES

A. Material: Pre-finished aluminum.
B. Provide L-shaped drip edges; extend horizontal leg 4 inches onto roof with vertical leg terminated with a 45 degree bent drip edge.
C. At Contractor's option, provide manufactured drip edges of type and profile required.

2.07 REGLETS

A. Manufactured Reglets: Units of type and profile required, formed to securely interlock with separate counterflashing pieces. Provide factory-mitered and welded corners and junctions.
1. Material: Same material and finish as counterflashing metal.
2. Surface Mounted Type: Provide slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
3. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
5. Accessories:
a. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge
6. Manufacturers:
a. Cheney Flashing Company: www.cheneyflashing.com.
b. Fry Reglet Corporation: www.fryreglet.com.
c. Heckmann Building Products, Inc.: www.heckmannbuildingprods.com.
d. Hohmann & Barnard, Inc.: www.h-b.com.
e. Substitutions: See Section 01 6000 - Product Requirements.

2.08 PRECAST CONCRETE SPLASH BLOCKS

A. Precast Concrete Splash Block:
1. Size: Approximately 12 inches wide by 30 inches long by 4 inches deep.
2. Color: Gray.
3. Weight: Approximately 50 pounds.
4. Manufacturers: Available manufacturer's include, but are not limited to, the following:
a. The Century Group: www.centurygrp.com.
b. Modern Pre-Cast, Inc.: www.modernprecast.com.
c. NuCast Precast Company: www.nucastprecast.com.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.
B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.
C. To prevent galvanic action or corrosion, back paint concealed metal surfaces with protective backing paint, minimum dry film thickness of 3 mil, where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates.

3.03 INSTALLATION - GENERAL

A. Install flashings and trim in accordance with SMACNA (ASMM) and NRCA (RM) requirements, unless more stringent methods are indicated.
B. Unless otherwise indicated, provide pre-finished aluminum flashings and trim in areas exposed to public view; at all other areas provide stainless steel flashings.
C. Insert flashings into reglets to form tight fit; secure in place with plastic wedges; seal flashings into reglets with sealant.
    1. Counterflashings shall lap base flashing 4 inches, minimum.
D. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
F. Seal metal joints watertight.
G. For stainless steel, solder metal joints for full metal surface contact, and after soldering wash metal clean with neutralizing solution and rinse with water.
    1. Do not solder aluminum.

3.04 GUTTERS AND DOWNSPOUTS

A. Secure gutters and downspouts in place with concealed fasteners.
    1. Gutter Supports: Space 30 inches on center, maximum.
    2. Downspout Supports: Locate at top and bottom of downspout and 60 inches on center, maximum.
B. Slope gutters 1/4 inch per 10 feet, minimum, unless otherwise indicated.
C. Where indicated, connect downspouts to downspout boots, and seal connection watertight.
D. Where gutters spill on grade, provide precast concrete splash block at each downspout discharge.

3.05 DRIP EDGES

A. Install at bottom edges of roof slopes, roof rakes, and elsewhere as indicated.
B. Fasteners: Space 18 inches on center, maximum.

3.06 REGLETS

A. Surface Mounted Type: Install according to manufacturer's instructions.
B. Refer to Section 03 3000 - Cast-in-Place Concrete, for casting reglets in concrete.
C. Refer to Section 04 2000 - Unit Masonry, for embedding reglets in masonry.

3.07 TOLERANCES

A. Sheet Metal Flashing and Trim Tolerances:
    1. Install to tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings.
    2. Install with 1/8 inch maximum offset of adjoining faces and of alignment of matching profiles.

3.08 CLEANING

A. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal manufacturer. Maintain sheet metal flashing and trim in clean condition.

B. Replace sheet metal flashing and trim damaged or deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 6200

SECTION 07 7100 - ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including:
   1. Gutters and downspouts.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
B. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement; 2025.
C. NRCA (RM) - The NRCA Roofing Manual; 2023.
D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
D. Samples:
   1. For each material and finish, submit three samples 4 by 4 inch inch in size illustrating metal finish color.
   2. Provide a full size sample, 12 inches long, for each of the following:
      a. Gutters and downspouts.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Gutters and Downspouts: Factory fabricated gutters and downspouts.
   1. Gutters: SMACNA rectangular style profile.
   2. Downspouts: SMACNA Rectangular profile.
   3. Material: Formed aluminum sheet, 0.063 inch thick, minimum.
   4. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM), unless otherwise indicated.
   5. Anchors and Supports: Profiled to suit gutters and downspouts.
      a. Anchoring Devices: Type recommended by fabricator, but not less than SMACNA requirements.
      b. Gutter Supports: Brackets.
      c. Downspout Supports: Brackets.
   6. Downspout Boots: Plastic, unless otherwise indicated.
   7. Finish: PVDF coating; 70 percent polyvinylidene fluoride.
   8. Color: Two coat custom color to match Architect's sample.
   9. Manufacturers:
      a. Architectural Products Co.; www.archprod.com.
      b. ATAS International, Inc.; www.atas.com.
      c. Metal-Era; www.metalera.com.
      d. OMG Roofing Products; www.omgroofing.com.
      e. Southern Aluminum Finishing Co, Inc.(SAF); www.saf.com <http://www.saf.com>.
      f. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system. Two or three-coat system, unless otherwise indicated.

2.03 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.
C. Roof Cement: ASTM D4586/D4586M, Type I.
D. Protective Backing Paint: Zinc molybdate alkyd.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 PREPARATION

A. To prevent galvanic action or corrosion, back paint concealed metal surfaces with protective backing paint, minimum dry film thickness of 3 mil, or provide other permanent separation as recommended by unit manufacturer, where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates.

3.03 INSTALLATION - GENERAL

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
B. Seal joints within components when required by component manufacturer.
C. Anchor components securely.
D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

3.04 GUTTERS AND DOWNSPOUTS

A. Secure gutters and downspouts in place with concealed fasteners.
   1. Gutter Supports: Space 30 inches on center, maximum.
   2. Downspout Supports: Locate at top and bottom of downspout and 60 inches on center, maximum.
B. Seal metal joints.
C. Slope gutters 1/4 inch per 10 feet, minimum, unless otherwise indicated.
D. Where indicated, connect downspouts to downspout boots, and seal connection watertight.

3.05 CLEANING

A. On completion of manufactured roof specialties installations, remove unused materials and clean finished surfaces as recommended by roof specialties manufacturers. Maintain finishes in clean condition.
B. Replace manufactured roof specialties damaged or deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 7100

SECTION 07 9200 - JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.
B. Self-leveling pourable joint sealants.
C. Joint backings and accessories.
D. Section 07 8400 - Firestopping: Firestopping sealants.
E. Section 07 9100 - Preformed Joint Seals: Precompressed foam, gaskets, and strip seals.
F. Section 08 8000 - Glazing: Glazing sealants and accessories.
G. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.02 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).
C. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.
F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).
G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.
I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2025).
J. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
    1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
    2. List of backing materials approved for use with the specific product.
    3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
    4. Substrates the product should not be used on.
    5. Substrates for which use of primer is required.
    6. Sample product warranty.
C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
D. Color Cards for Selection: Where custom colors are not specified, submit manufacturer's color cards showing standard colors available for selection.
E. Samples for Verification: For each sealant color, submit at least three physical samples for color verification.

1. Provide 1/2 inch wide joint sealant samples formed between two 4 inch long strips of material matching appearance of exposed surfaces adjacent to joint sealants.

F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

G. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

H. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least 5 years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.

1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.
3. Stain Testing: In accordance with ASTM C1248; required only for stone substrates.
4. Allow sufficient time for testing to avoid delaying the work.
5. Deliver to manufacturer sufficient samples for testing.
6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

D. Owner may employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.

1. Contractor shall cooperate with testing agency and repair failures discovered.
2. Otherwise, if Owner does not employ an independent testing agency, Contractor shall perform its own field quality control measures including the following:
   a. Field Quality Control Plan and Log.
   b. Field Adhesion Test Procedures.

E. Field Quality Control Plan:

1. Visual inspection of entire length of sealant joints.
2. Non-destructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
   a. For each different sealant and substrate combination, allow for one test every 12 inches in the first 10 linear feet of joint and one test every 120 inches thereafter.
   b. If any failures occur in the first 10 linear feet, continue testing at 48 inch intervals at no extra cost to Owner.

F. Field Adhesion Test Procedures:

1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
4. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
5. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.
   a. Record results on Field Quality Control Log.

b. Repair failed portions of joints.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
   a. Wall expansion and control joints.
   b. Joints between door, window, and other frames and adjacent construction.
   c. Joints between different exposed materials.
   d. Openings below ledge angles in masonry.
   e. Other joints as indicated.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. Other joints as indicated.
3. Do not seal the following types of joints.
   a. Intentional weepholes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

1. Control and Expansion Joints in Concrete Paving: Self-leveling silicone traffic-grade sealant.

C. Interior Joints: Use non-sag acrylic emulsion latex sealant, unless otherwise indicated.

1. Interior Sides of Aluminum Framing in Exterior Walls: Use non-sag non-staining silicone sealant, unless otherwise indicated.
   a. Includes, but is not limited to, curtain walls, storefronts, and metal-framed skylights.
2. Control Joints in Interior Concrete Slabs: Self-leveling silicone "traffic grade" sealant.
3. Column Isolation Joints in Interior Concrete Slabs: Self-leveling silicone "traffic grade" sealant.
4. Floor Joints in Wet Areas: Self-leveling silicone "traffic grade" sealant; not for continuous liquid immersion
5. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; clear, unless otherwise indicated.
6. Joints between countertops and walls: Mildew-resistant silicone sealant; clear, unless otherwise indicated.

D. Interior Wet Areas: Includes, but is not limited to, toilet rooms, showering areas, locker rooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.02 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Type S, Uses NT, A, G, M and O; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 50 percent, minimum.

2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Hardness Range: Comply with one of the following:
   a. 15 to 35, Shore A, when tested in accordance with ASTM C661.
   b. 25 to 35, Shore A, when tested in accordance with ASTM D2240.
5. Color: Custom color(s) to match Architect's sample(s).
6. Cure Type: Single-component, neutral moisture curing.
7. Service Temperature Range: Minus 40 to 250 degrees F.
8. Products:
   a. Momentive Performance Materials, Inc./GE; SCS9000 SilPruf NB: www.siliconeforbuilding.com.
   b. Pecora Corporation; 890NST: www.pecora.com.
   c. Sika Corporation; Sikasil WS-295 FPS: www.usa.sika.com.
   d. Tremco, Inc.; Spectrem 3: www.tremcosealants.com.
   e. Dow Chemical Company; DOWSIL 790 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   f. Substitutions: See Section 01 6000 - Product Requirements.

B. Traffic Grade Silicone Sealant: ASTM C920, Grade NS, Type S, Uses T, M, and O; not expected to withstand continuous water immersion.
1. Movement Capability: Plus 100 percent, minus 50 percent, minimum
2. Hardness Range: Comply with one of the following:
   a. 5 to 15, Shore A, when tested in accordance with ASTM C661.
   b. 85, Shore 00, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's full range.
4. Cure Type: Single-component, neutral moisture curing.
5. Service Temperature Range: Minus 40 to 250 degrees F.
6. Products:
   a. Dow Corning; NS Parking Structure Sealant: www.dowcorning.com.
   b. Pecora Corporation; 311NS: www.pecora.com.
   c. Sika Corporation; Sikasil - 728 NS: www.usa.sika.com.
   d. Tremco, Inc.; Spectrem 800: www.tremcosealants.com.
   e. Substitutions: See Section 01 6000 - Product Requirements.

C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Type S, Uses NT, A, G, and O; mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: Comply with one of the following:
   a. 15 to 35, Shore A, when tested in accordance with ASTM C661.
   b. 25 to 35, Shore A, when tested in accordance with ASTM D2240.
3. Color: Clear.
4. Cure Type: Single-component, acetoxy or neutral moisture curing .
5. Service Temperature Range: Minus 40 to 300 degrees F.
6. Products:
   a. Dow Corning; 786 Sealant M: www.dowcorning.com.
   b. Momentive Performance Materials, Inc./GE; SCS1700 Sanitary: www.siliconeforbuilding.com.
   c. Pecora Corporation; 898NST: www.pecora.com.
   d. Sika Corporation; Sikasil - GP: www.usa.sika.com.
   e. Tremco, Inc.; Tremsil 200 with fungicide: www.tremcosealants.com.
   f. Substitutions: See Section 01 6000 - Product Requirements.

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use. Siliconized.
1. Color: To be selected by Architect from manufacturer's full range.

2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).
3. Products:
   a. Franklin International Inc; Titebond Painter's Plus Caulk: www.titebond.com.
   b. Pecora Corporation; AC-20 +Silicone: www.pecora.com.
   c. Sherwin Williams; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com.
   d. Tremco, Inc.; Tremflex 834: www.tremcosealants.com.
   e. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SELF-LEVELING SEALANTS

A. Self-Leveling Silicone Sealant: ASTM C920, Type S, Grade P, Uses T, M and O; single-component, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
   1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
   2. Hardness Range: Comply with one of the following:
      a. 5 to 20, Shore A, when tested in accordance with ASTM C661.
      b. 40 to 85, Shore 00, when tested in accordance with ASTM D2240.
   3. Color: To be selected by Architect from manufacturer's full range.
   4. Cure Type: Single-component, neutral moisture curing.
   5. Service Temperature Range: Minus 50 to 300 degrees F.
   6. Products:
      a. Dow Corning; SL Parking Structure Sealant: www.siliconeforbuilding.com.
      b. Pecora Corporation; 310SL: www.pecora.com.
      c. Sika Corporation; Sikasil-728 SL: www.usa.sika.com.
      d. Tremco, Inc.; Spectrem 900SL: www.tremcosealants.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
   2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
   3. Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C1193.
C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.
D. Install bond breaker backing tape where backer rod cannot be used.
E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.
I. Installation of Two-Stage Joints at Precast Architectural Concrete Units:
    1. Joint system consists of two back-to-back sealant joints at each precast architectural concrete unit joint with a weep at the bottom of the unit joint per Precast/Prestressed Concrete Institute (PCI) recommendations and as follows:
        a. Inner (Secondary) Seal: Inner secondary backer rod and sealant joint is installed a minimum of 2 to 2-1/2 inches beyond the exposed face of the precast architectural concrete panels within the panel joint itself.
        b. Exterior (Primary) Seal: Following the installation of the secondary joint, the outer primary backer rod and sealant joint is installed at the face of the precast architectural concrete panels with a weep at the bottom of the joint. Leave open continuous air space between the primary backer rod and inner secondary seal.
        c. Install 3/8 inch minimum weep openings in the exterior seal to allow water penetrating the exterior seal and contained by the inner seal to exit the cavity between joint seals.
            1) Do not install weeps below finish grades.
        d. Near the junction of horizontal and vertical joints, the inner seal must turn out to the plane of the exterior seal at regular intervals to force water out of the joint.

3.04 FIELD QUALITY CONTROL

A. Owner may employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.
B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.
C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION 07 9200

SECTION 08 3100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 DEFINITIONS

A. Wet Areas: Includes the following:
   1. Exterior locations.
   2. Areas as indicated.

B. Non-Wet Areas: Areas that are not indicated or listed as wet areas including, but not limited to, the following:
   1. Storage Garages
   2. Toilet rooms.
   3. Janitor closets.

1.03 REFERENCE STANDARDS

A. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ITS (DIR) - Directory of Listed Products; Current Edition.

D. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Project Record Documents: Record actual locations of each access unit.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years documented experience.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel: Sheet complying with the following:
   1. All areas except wet areas: ASTM A1008/A1008M.
   2. Wet areas: ASTM A653/A653M Grade 33; A40 galvannealed.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:
   1. Acudor; www.acudor.com.
   2. Babcock-Davis; www.babcockdavis.com.
   3. JL Industries/Activar Construction Products Group, Inc; www.activarcpg.com/jl-industries.
   4. Karp Associates, Inc; www.karpinc.com.
   5. Larsen’s Manufacturing Company: www.larsenmfg.com.
   6. Milcor / Hart & Cooley Inc; www.milcorinc.com.
   7. MIFAB, Inc.; www.mifab.com.
   8. Nystrom; www.nystrom.com.
   9. Substitutions: See Section 01 6000 - Product Requirements.

B. General:

1. Factory fabricate doors and frames.
2. Fully assemble units with corner joints welded, filled and ground flush; square and without rack or warp.
3. Coordinate requirements with type of installation assembly being used for each unit.

C. Flush Access Doors with Exposed Flanges:
1. Locations: Masonry.
2. Material: Steel.
3. Style: Exposed frame with door surface flush with frame surface.
   a. Masonry Mounting Criteria: Provide masonry anchor straps.
4. Door Style: Single thickness with rolled or turned in edges.
5. Doors: 14 gage, 0.0747 inch, minimum thickness.
6. Frames: 16 gage, 0.0598 inch, minimum thickness.
7. Steel Finish: Primed; manufacturer's standard rust-inhibitive powder coat.
8. Door/Panel Size: As indicated on the drawings.
9. Hardware:
   a. Hinges: Concealed, constant force closure spring type.
   b. Handle: No handle.
   c. Latch/Lock: Screw driver slot for quarter turn cam latch.
   d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.

D. Flush Access Doors with Concealed Flanges:
1. Locations: Gypsum board.
2. Material: Steel.
3. Style: Concealed flange for drywall.
   a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
4. Door Style: Single thickness with rolled or turned in edges.
5. Doors: 14 gage, 0.0747 inch, minimum thickness
6. Frames: 16 gage, 0.0598 inch, minimum thickness.
7. Steel Finish: Primed; manufacturer's standard rust-inhibitive powder coat.
8. Door/Panel Size: As indicated on the drawings.
9. Hardware:
   a. Hinges: Concealed, constant force closure spring type.
   b. Handle: No handle.
   c. Latch/Lock: Screw driver slot for quarter turn cam latch.
   d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.

E. Fire-Rated, Flush, Uninsulated, Access Doors with Exposed Flanges:
1. Locations: Masonry.
2. Material: Steel.
3. Style: Exposed frame with door surface flush with frame surface.
   a. Masonry Mounting Criteria: Provide masonry anchor straps.
4. Door Style: Single thickness with rolled or turned in edges.
5. Doors: 16 gage, 0.0598 inch, minimum thickness
6. Frames: 16 gage, 0.0598 inch, minimum thickness.
7. Fire-Rating: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
   a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
8. Steel Finish: Primed; manufacturer's standard rust-inhibitive powder coat.
9. Door/Panel Size: As indicated on the drawings.
10. Hardware: Automatic closing, self-latching, with interior latch release.
    a. Hinges: Exposed, continuous piano hinge.
    b. Handle: No handle.
    c. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.

d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
e. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.

F. Fire-Rated, Flush, Uninsulated, Access Doors with Concealed Flanges:
1. Locations: Gypsum board.
2. Material: Steel.
3. Style: Concealed flange for drywall.
a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
4. Door Style: Single thickness with rolled or turned in edges.
5. Doors: 16 gage, 0.0598 inch, minimum thickness
6. Frames: 16 gage, 0.0598 inch, minimum thickness.
7. Fire-Rating: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
8. Steel Finish: Primed; manufacturer's standard rust-inhibitive powder coat.
9. Door/Panel Size: As indicated on the drawings.
10. Hardware: Automatic closing, self-latching, with interior latch release.
a. Hinges: Exposed continuous piano hinge.
b. Handle: No handle.
c. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.
d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
e. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.
B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.
B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.
B. Install frames plumb and level in openings, and secure units rigidly in place.
C. Position units to provide convenient access to concealed equipment when necessary.

3.04 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 3100

SECTION 08 9100 - LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
B. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).
C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.
D. Samples: Submit three samples 4 by 4 inches in size illustrating finish and color of exterior and interior surfaces.
E. Test Reports: Independent agency reports showing compliance with specified performance criteria.
F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum 5 years of documented experience.
B. Installer Qualifications: Company specializing in performing work of type specified and with at least 5 years of documented experience.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.
    1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Louvers - Drainable Blades:
    1. The Airolite Company, LLC; Model K6744: www.airolite.com.
    2. Arrow United Industries; Model EA-425-DD: www.arrowunited.com.
    3. Construction Specialties, Inc.; Model A4097: www.c-sgroup.com.
    4. Greenheck Fan Corporation; Model ESD-435: www.greenheck.com.
    5. Industrial Louvers, Inc.; Model 458XP: www.industriallouvers.com.
    6. Ruskin; Model ELF375DX: www.ruskin.com.
    7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
   1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
   2. Beginning point of water penetration at 0.01 oz/sq ft is 850 fpm, minimum.
   3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
   4. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with concealed intermediate mullions.
   1. Free Area: 50 percent, minimum.
   2. Blades: Drainable.
   3. Frame: 4 inches deep, channel profile; corner joints mitered.
   4. Aluminum Thickness: Frame 12 gage, 0.081 inch minimum; blades 12 gage, 0.081 inch minimum.
   5. Aluminum Finish: Superior performing organic coatings; finish welded units after fabrication.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T5 or T6 temper.

2.04 FINISHES

A. Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.
   1. Color: Two-coat custom color to match Architect's sample.

2.05 ACCESSORIES

A. Blank-Off Panels: Aluminum face and back sheets, polyisocyanurate foam core, 2 inch thick, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

B. Screens: Frame of same material as louver, with mitered and welded corners; removable, screw attached; installed on inside face of louver frame.

C. Bird Screen: Interwoven wire mesh of steel, 14 gage, 0.0641 inch diameter wire, 1/2 inch open weave, square design.

D. Insect Screen: 18 x 16 size aluminum mesh.

E. Fasteners and Anchors: Stainless steel.

F. Flashings: Sheet aluminum, formed to required shape, single length in one piece per location.
   1. Comply with ASTM B209.
   2. Minimum Thickness: 0.032 inches thick.
   3. Includes, but is not limited to, the following:
      a. Extended sill with drip edge.

G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

B. Install louvers level and plumb.

C. Set sill members and sill flashing in continuous bead of sealant.
D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
E. Secure louver frames in openings with concealed fasteners.
F. Coordinate with installation of mechanical ductwork.

3.03 CLEANING

A. Strip protective finish coverings.
B. Clean surfaces and components.

END OF SECTION 08 9100

SECTION 09 9113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Primers.
   2. Finish coatings.

B. Related Requirements:
   1. Section 05 5213 "Pipe and Tube Railings" for shop pipe and tube railings.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include preparation requirements and application instructions.
   2. Indicate VOC content.

B. Samples: For each type of topcoat product.

C. Samples for Initial Selection: For each type of topcoat product.

D. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

E. Product Schedule: Use same designations indicated on Drawings and in the Exterior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.04 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. Paint Products: 5 percent, but not less than 1 gal. of each material and color applied.

1.05 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

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.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.07 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain each paint product from single source from single manufacturer.

2.02 PAINT PRODUCTS, GENERAL

A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.
1. 10 percent of surface area will be painted with deep tones.

2.03 PRIMERS

A. Water-Based, Galvanized-Metal Primer: Corrosion-resistant, pigmented, acrylic primer; formulated for use on cleaned/etched, exterior, galvanized metal to prepare it for subsequent water-based coatings.

2.04 FINISH COATINGS

A. High-Build Epoxy Paint, Low Gloss: High-solids, two-component epoxy; formulated for use on exterior concrete, masonry, and primed-metal surfaces.
1. Gloss and Sheen Level: Manufacturer's standard low-gloss finish.

B. Exterior, Water-Based, Light Industrial Coating, Low Sheen: Corrosion-resistant, water-based, pigmented, emulsion coating formulated for resistance to blocking (sticking of two painted

surfaces), water, alkalis, moderate abrasion, and mild chemical exposure and for use on exterior, primed, wood and metal surfaces.
1. Gloss and Sheen Level: Manufacturer's standard low-sheen finish.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems specified in this Section.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer. but not less than the following:
1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7/NACE No. 4.
4. SSPC-SP 11.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.03 INSTALLATION

A. Apply paints in accordance with manufacturer's written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

3. Paint exterior side and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in the Exterior Painting Schedule may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.05 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 EXTERIOR PAINTING SCHEDULE, METAL SUBSTRATES

A. Galvanized-Metal Substrates:

1. Water-Based, Light Industrial Coating System:
   a. Prime Coat: Water-based, galvanized-metal primer.
   b. Intermediate Coat: Matching topcoat.
   c. Topcoat: Exterior, water-based, light industrial coating, low sheen.

END OF SECTION 09 9113

SECTION 11 6833.33 - SPORTS FIELD EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section Includes:
   1. Backstop protective wall padding.
   2. Bases, home plates, pitching rubbers and accessories.
   3. Pitcher’s mound.

1.02 REFERENCES

A. Selective court equipment in this Section complies with the following:
   1. American Sports Builders Association (ASBA).
   2. National Federation of State High School Associations (NFHS).
   3. National Collegiate Athletic Association (NCAA).
   4. International Amateur Athletic Association (IAFF).

1.03 SUBMITTALS

A. Submit under provisions of Section 01 3000.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Verification Samples: Two representative units of each type, size, pattern, and color.

D. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum of five years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.05 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.07 PROJECT CONDITIONS

A. Maintain environmental temperature, humidity, and ventilation conditions within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 WARRANTY

A. Manufacturer's standard Limited warranty unless indicated otherwise.

PART 2 PRODUCTS

2.01 FIELD EQUIPMENT

A. Backstop protective wall padding: Basis of Design Requirements: Subject to compliance with requirements, provide the product indicated below, or approved equal:
   1. Manufacture: AER-FLO, INC; Phone: 800.823.7356.
   2. Product: AER-Cushion Stadium Pad - 3” thick polyurethane high impact foam securely glued to ¾” solid plywood backing; Z-channel attachment, 18 oz fully coated vinyl.
   3. Color: To be selected by Owner.

B. Home Plate and Permanent Pitching Rubber.
   1. Manufacture: National Sports Products; P.O. Box 407; Eldridge, IA, 52748. Phone: 800.478.6497.
   2. Home Plates:
      a. Safety First Beveled Edge Five-Spike Home Base Plate: Item No. 36544.
         1) Rawlings home plate with beveled edge, black, and five metal spikes.
         2) Plate Size: Official.
   3. Pitching Rubbers:
      a. Pro Step Down Pitching Rubber, Official Size: Item No. 36576H.
         1) Rawlings Pro, regulation size, heavy-duty rubber with waffle bottom.

C. Pitcher’s Mound.
   1. Manufacture: DuraEdge. Phone: 866.867.0052.
   2. Mound Clay:
      a. Dura Pitch Proloc Mound Blocks.
   3. Infield Soil:
      a. Classic Infield Mix.

D. Batting Mat and Portable Pitching Rubber.
   1. Manufacture: Pro Sports Equip; Phone: 866.400.0424.
   2. Batting Mat:
      a. Jaypro Batting Mat; Item No. BML612G.
         1) Turf Color: Green.
         2) Size: 6’L x 12’W.
         3) Inlaid white lines and thick foam backing.

3. Portable Pitching Rubber:
   a. Soft Touch Pitching Rubber Base for Turf: Item No. TPR.
      1) Durable cut resistant polyurethane
      2) Product Dimensions: 24 1/4” x 6 1/8” x ¾” .

PART 3 EXECUTION

3.01 EXAMINATION

B. Do not begin installation until the substrates have been properly constructed and prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.02 PREPARATION

B. Clean surfaces thoroughly prior to installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

B. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

3.04 FIELD QUALITY CONTROL

B. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

C. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.05 CLEANING AND PROTECTION

B. Clean products in accordance with the manufacturers recommendations.

C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 26 0010 - ELECTRICAL GENERAL REQUIREMENTS

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.02 SUMMARY

A. This Section includes electrical general administrative and procedural requirements. The following requirements are included in this Section to supplement the requirements specified in Division 1 Specification Sections.

1.03 REFERENCES

A. All materials shall be new. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable Standard Specifications of the following recognized authorities:

1. ANSI - American National Standards Institute; www.ansi.org.
2. ASTM - ASTM International; www.astm.org.
3. CSI - Construction Specifications Institute (The); www.csiresources.org.
4. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
5. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
6. NEC - National Electrical Code
7. NECA - National Electrical Contractors Association; www.necanet.org.
   a. NECA 1-2000, “Practices for Good Workmanship in Electrical Contracting (ANSI).”
8. NEMA - National Electrical Manufacturers Association; www.nema.org.
9. NETA - InterNational Electrical Testing Association; www.netaworld.org.
10. UL - Underwriters Laboratories Inc.; www.ul.com.

1.04 QUALITY ASSURANCE

A. Scope of Work: Furnish all labor, material, equipment, technical supervision, and incidental services required to complete, test, and leave ready for operation the electrical systems as specified in the Division 26 Sections and as indicated on Drawings.
   1. Contract Documents are complementary, and what is required by one shall be as binding as if required by all. In the event of inconsistencies or disagreements within the Construction Documents bids shall be based on the most expensive combination of quality and quantity of the work indicated.
   2. The Contractor understands that the work herein described shall be complete in every detail.

B. Ordinances and Codes: Perform all Work in accordance with applicable Federal, State, and local ordinances and regulations, the Rules and Regulations of NFPA, NECA, and UL, unless otherwise indicated.
   1. Notify the Architect/Engineer if revisions to the Drawings or Specifications are required to conform to applicable ordinances, codes, or regulations. Identify the cost associated with these revisions in the bid.

C. Source Limitations: All equipment of the same or similar systems shall be by the same manufacturer.

D. Tests and Inspections: Perform all tests required by state, city, county, and/or other agencies having jurisdiction. Provide all materials, equipment, etc., and labor required for tests.

E. Performance Requirements: Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the trades involved.

F. Sequence and Schedule: Avoid interference with the work of other trades. Remove and relocate any work which in the opinion of the Owner’s Representatives causes interference.

1.05 CODES, PERMITS AND FEES

A. Unless otherwise indicated, all required permits, licenses, inspections, approvals, and fees for electrical work shall be secured and paid for by the Contractor. All work shall conform to all applicable codes, rules, and regulations.

B. Comply with rules of local utility companies. Coordinate with the utility company supplying service to the installation and determine all devices including, but not limited to, all current and potential transformers, meter boxes, C.T. cabinets, and meters which will be required and include the cost of all such items and all utilities costs in proposal.

C. All work shall be executed in accordance with the rules and regulations outlined in local and state codes. Prepare any detailed Drawings or diagrams which may be required by the governing authorities. Where the Drawings and/or Specifications indicate materials or construction that exceed code requirements, the Drawings and/or Specifications shall govern.

1.06 DRAWINGS

A. The Drawings show the location and general arrangement of equipment, electrical systems, and related items. They shall be followed as closely as elements of the construction will permit.

B. Examine the Drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes, and accessories as may be required to meet such conditions.

C. Deviations from the Drawings, apart from minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.

D. The architectural and structural Drawings take precedence in all matters pertaining to the building structure, mechanical Drawings in all matters pertaining to mechanical trades, and electrical Drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the Drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.

E. Drawings are not intended to be scaled for rough-in or to serve as shop drawings. Take all field measurements required to complete the Work.

1.07 MATERIAL AND EQUIPMENT MANUFACTURERS

A. All items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new, be standard products of manufacturers regularly engaged in the production of electrical equipment and be of the manufacturer's latest design.

B. If an approved manufacturer is other than the manufacturer used as the basis for design, the equipment or product provided shall be equal in size, quality, durability, appearance, capacity, and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system and shall comply with the requirements for Items Requiring Prior Approval specified in this section of the Specifications. All costs to make these items of equipment comply with these requirements including, but not limited to, electrical work, and building alterations shall be included in the original Bid. Similar equipment shall be by one manufacturer.

C. Where existing equipment is modified to include new switches, circuit breakers, metering, or other components, the new components shall be by the original equipment manufacturer and shall be listed for installation in the existing equipment. Where original equipment manufacturer components are not available, third-party aftermarket components shall be listed for the application and submitted to the engineer for approval. Reconditioned or salvaged components shall not be used unless specifically indicated on the drawings.

1.08 INSPECTION OF SITE

A. Visit the site, examine, and verify the conditions under which the Work must be conducted before submitting Proposal. The submitting of a Proposal implies that the Contractor has visited the site and understands the conditions under which the Work must be conducted. No additional charges will be allowed because of failure to make this examination or to include all materials and labor to complete the Work.

1.09 ITEMS REQUIRING PRIOR APPROVAL

A. Bids shall be based upon manufactured equipment specified. All items that the Contractor proposes to use in the Work that are not specifically named in the Contract Documents must be submitted for review prior to bids. Such items must be submitted in compliance with Division 1 specifications. Requests for prior approval must be accompanied by complete catalog information, including but not limited to, model, size, accessories, complete electrical information, and performance data in the form given in the equipment schedule on the drawings at stated design conditions. Where items are referred to by symbolic designations on the drawings, all requests for prior approval shall bear the same designations.

1. Equipment to be considered for prior approval shall be equal in quality, durability, appearance, capacity, and efficiency through all ranges of operation, shall fulfill the requirements of equipment arrangement and space limitations of the equipment shown on the plans and/or specified and shall be compatible with the other components of the system.

2. All costs incurred to make equipment comply with other requirements, including providing maintenance, clearance, electrical, replacement of other components, and building alterations shall be included in the original bid.

B. Voluntary alternates may be submitted for consideration, with listed addition or deduction to the bid.

1.10 SHOP DRAWINGS/SUBMITTALS

A. Submit project-specific submittals for review in compliance with Division 1.

B. All shop Drawings shall be submitted in groupings of similar and/or related items (lighting fixtures, switchgear, etc.). Incomplete submittal groupings will be returned unchecked.

C. If deviations (not substitutions) from the Contract Documents are deemed necessary by the Contractor, the details of such deviations, the reason for the deviation, and the resulting changes shall be included with the submittal for approval.

D. Submit for approval shop drawings for electrical systems or equipment indicated in other sections of electrical specs. Where items are referred to by symbolic designation on the Drawings and Specifications, all submittals shall bear the same designation (light fixtures).

1.11 COORDINATION DRAWINGS

A. Submit project specific coordination drawings for review in compliance with Division 1 Specification Sections.

1.12 OPERATION AND MAINTENANCE INSTRUCTIONAL MANUALS

A. Submit project specific Operation and Maintenance Instructional Manuals for review in compliance with Division 01 Specification Sections.

B. Provide complete operation and maintenance instructional manuals covering all electrical equipment herein specified, together with parts lists. Maintenance and operating instructional manuals shall be job specific to this project. Generic manuals are not acceptable. Manual shall be provided on electronic media. All literature shall be combined in one document and shall be properly bookmarked with all applicable sections. Maintenance and operating instructional manuals shall be provided when construction is approximately 75% complete.

C. The operating and maintenance instructions shall include a brief, general description for all electrical systems including, but not limited to:

1. Routine maintenance procedures.

2. Trouble-shooting procedures.

3. Contractor's telephone numbers for warranty repair service.

4. Submittals.
5. Recommended spare parts list.
6. Names and telephone numbers of major material suppliers and subcontractors.
7. System schematic drawings on 8-1/2" x 11" sheets.

1.13 RECORD DRAWINGS

A. Submit record drawings in compliance with Division 01.

B. Contractor shall submit to the Architect/Engineer, record drawings on electronic media which have been neatly marked to represent as-built conditions for all new electrical work. Modifications to original drawings shall be marked with a contrasting color so the marks are readily apparent.

C. The Contractor shall keep accurate note of all deviations from the construction documents and discrepancies in the underground concealed conditions and other items of construction on field drawings as they occur. The marked up field documents shall be available for review by the Architect, Engineer, and Owner at their request during construction.

1.14 INSTRUCTION OF OWNER PERSONNEL

A. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of electrical equipment and systems at agreed upon times. A minimum of 8 hours of formal instruction to Owner's personnel shall be provided for each building. Additional hours are specified in individual specification sections.

B. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

C. In addition to individual equipment training provide overview of each electrical system. Utilize the as-built documents for this overview.

D. Prepare and insert additional data in operation and maintenance manual when need for such data becomes apparent during instruction, or as requested by Owner.

1.15 WARRANTY

A. Warranty: Comply with the requirements in Division 01 Specification Sections. Contractor shall warranty that the electrical installation is free from defects and agrees to replace or repair, to the Owner’s satisfaction, any part of this electrical installation which becomes defective within a period of one year (unless specified otherwise in other Division 26 sections) from the date of substantial completion following final acceptance, provided that such failure is due to defects in the equipment, material, workmanship, or failure to follow the contract documents.

B. Contractor shall be responsible for any temporary services including equipment and installation required to maintain operation as a result of any equipment failure or defect during warranty period.

C. File with the Owner all warranties from the equipment manufacturers including the operating conditions and performance capacities they are based on.

1.16 USE OF EQUIPMENT

A. The use of any equipment, or any part thereof for purposes other than testing even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor be construed to obligate the Owner in any way to accept improper work or defective materials.

B. Do not use Owner's lamps for temporary lighting except as allowed and directed by the Owner. Equip lighting fixtures with new lamps when the project is turned over to the Owner.

1.17 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. To ensure that connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions; and to maintain the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. 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."

D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 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.

3.02 DEMOLITION WORK

A. All demolition of existing electrical equipment and materials will be done by this Contractor unless otherwise indicated. Include all items related to the existing systems that are being removed such as, but not limited to, electrical equipment, cabinets, devices, lighting fixtures, conduit, fittings, boxes, wiring, and supports. No abandoned components of the electrical systems indicated to be removed shall remain.

1. Where electrically powered equipment is included in the demolition scope of other trades, disconnect electrical wiring connections and remove circuit wiring complete.

B. In general, demolition work is indicated on the Drawings. However, the Contractor shall visit the job site to determine the full extent and character of this work.

C. Unless specifically noted otherwise, removed materials shall not be reused in the work.

1. Materials indicated to be salvaged shall be carefully removed, stored, and protected from damage.
2. Salvaged materials intended to be re-used shall be thoroughly cleaned, refurbished if necessary, and determined to be fully functional prior to placing back into service.
3. Salvaged materials of value that are not to be reused shall remain the property of the Owner unless such ownership is waived. Items that the Owner has waived ownership shall

become the property of the Contractor, who shall remove and legally dispose of same, away from the premises.

D. Where equipment or fixtures are removed, outlet boxes that remain recessed in walls shall be properly blanked off, and conduits capped. After alterations are complete, the entire installation shall present a "finished" look, as approved by the Architect/Engineer. The original function of the present electrical systems remaining in service shall not be changed unless specifically indicated as part of the project scope.

E. Reroute signal wires, lighting, and power wiring as required to maintain services that are to remain and/or unaffected by the renovations. Where walls and ceilings are to be removed as shown on the Drawings, the conduit is to be cut off by the Electrical Trades so that the abandoned conduit in these walls and ceilings may be removed with the walls and ceilings by the Architectural Trades. All dead-end conduit runs shall be plugged at the remaining line outlet boxes or the panels.

F. Where new walls and/or floors are installed which interfere with existing outlets, devices, etc., the Electrical Trades shall adjust, extend and reconnect such items as required to maintain continuity of same.

G. All electrical work in altered and unaltered areas shall be run concealed wherever possible. Use of surface raceway or exposed conduits will be permitted only where specifically indicated on the drawings or approved by the Architect/Engineer.

H. Existing lighting shall be reused where indicated on plans. Reused fixtures shall be detergent cleaned, re-lamped, and reconditioned suitable for satisfactory operation and appearance.

3.03 INSTALLATION OF EQUIPMENT

A. Install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions conflict with the Drawings and Specifications, report such conflicts to the Architect/Engineer for resolution.

B. Device Location:

1. Allow for wiring devices, control devices, and fire alarm devices to be relocated within a 10’ radius to accommodate final coordination with furnishings and other finish elements. Devices relocated prior to installation shall be done without additional cost to the project.

3.04 WORK IN EXISTING BUILDINGS

A. The Owner will provide access to existing buildings as required. Access requirements to occupied buildings shall be identified on the project schedule. The Contractor, once Work is started in the existing building, shall complete same without interruption to return work areas as soon as possible to Owner.

B. Adequately protect and preserve all existing and newly installed Work. Promptly repair any damage to same at Contractor's expense.

C. Consult with the Owner’s Representative as to the methods of carrying on the Work so as not to interfere with the Owner's operation any more than necessary. Accordingly, all service lines shall be kept in operation as long as possible and the services shall only be interrupted at such time as will be designated by the Owner's Representative.

D. Prior to starting work in any area, obtain approval for doing so from a qualified representative of the Owner who is designated and authorized by the Owner to perform testing and abatement of all hazardous materials including but not limited to, asbestos. The Contractor shall not perform any inspection, testing, containment, removal, or other work that is related in any way whatsoever to hazardous materials under the Contract.

3.05 TEMPORARY SERVICES

A. Provide and remove upon completion of the project, following the general conditions and as described in Division 01, a complete temporary electrical and telephone service during construction.

3.06 DISPOSAL

A. Fluorescent Lamps

1. Fluorescent lamps are known to contain mercury and are classified as hazardous material. All fluorescent lamps shall be assumed to contain mercury unless tested and confirmed otherwise with a toxicity characteristic leaching procedure (TCLP).
2. Hazardous materials (fluorescent lamps), shall be sent to a lamp recycling facility. The materials shall be properly packaged with labels that meet the Department of Transportation Regulations and stored in a secure location before transportation.
3. The Contractor shall identify the costs of the lamp disposal process including, but not limited to, the lamp packaging, storage, transportation, disposal, and any profile fees.
4. Upon completion of the project, provide documentation to verify that the lamps have been properly disposed of in accordance with all local, state, and federal guidelines.

B. Ballasts

1. Lighting ballasts manufactured prior to 1979 have been known to contain polychlorinated biphenyls (PCBs). Unless specifically noted on the ballast as containing "No PCBs," the ballast shall be assumed to contain components with PCB materials.
2. Hazardous materials (ballasts with PCBs), shall be disposed of at a hazardous waste incineration facility, or at a recycling facility in accordance with the Code of Federal Regulations as administered by the EPA in regards to this issue. The ballasts shall be packaged/stored in fifty-five gallon steel drums with labels that meet the Department of Transportation Regulations.
3. The Contractor shall identify the costs of the ballast disposal process including, but not limited to, the packaging, storage, transportation, disposal, and any profile fees.
4. Provide at completion of the project documentation (manifests) to verify that the ballasts have properly been disposed of in accordance with all local, state, and federal guidelines.

3.07 CHASES AND RECESSES

A. Provided by the architectural trades, but the Contractor shall be responsible for their accurate location and size.

3.08 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

A. Refer to General Conditions for requirements.

B. All cutting, patching, and repair work shall be performed by the Contractor through approved, qualified subcontractors. Contractor shall include full cost of same in bid.

3.09 EXCAVATION AND BACKFILLING

A. Provide all excavation, trenching, tunneling, dewatering, and backfilling required for the electrical work. Coordinate the work with other excavating and backfilling in the same area.

B. Where conduit is installed less than 2'6" below the surface of pavement, provide concrete encasement, 4" minimum coverage, all around or as shown on the electrical Drawings.

C. Backfill all excavations with well-tamped granular material. Backfill all excavations under wall footings with lean mix concrete up to underside of footings and extend concrete within excavation a minimum of four (4) feet each side of footing. Granular backfill shall be placed in layers not more

than 8 inches in thickness, 95 percent compaction throughout with approved compaction equipment. Tamp, roll as required. Excavated material shall not be used.

D. Backfill all excavations inside building, under drives, and parking areas with well-tamped granular material. Granular backfill shall be placed in layers not more than 8 inches in thickness, 95 percent compaction throughout with approved compaction equipment. Tamp, roll as required. Excavated material shall not be used.

E. Backfill outside building with granular material to a height 12 inches over top of pipe compacted to 95 percent compaction as specified above. Backfill remainder of excavation with unfrozen excavated material in such a way as to prevent settling.

3.10 EQUIPMENT CONNECTIONS

A. Make connections to equipment and other items included in the work in accordance with the approved shop Drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. All additional connections not shown on the Drawings, but called out by the equipment manufacturer's shop Drawings shall be provided.

3.11 CLEANING

A. All debris shall be removed daily as required to maintain the work area in a neat, orderly condition.

B. Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

3.12 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Equipment and materials shall be protected from theft, injury, or damage.

B. Protect conduit openings with temporary plugs or caps.

C. Provide adequate storage for all equipment and materials delivered to the job site. Location of the space will be designated by the Owner's representative or Architect/Engineer. Equipment set in place in unprotected areas must be provided with temporary protection.

3.13 EXTRA WORK

A. For additional electrical work which may be proposed or requested, furnish an itemized cost breakdown of material and labor required to complete the work. Proceed only after receiving a written authorization.

B. Before providing an itemized break-down for additional electrical work, submit unit prices for the following items: 1/2", 3/4", 1", 1-1/2" EMT conduit; #12, #10, #8, #6, #2 building wire; duplex receptacles, GFCI receptacles, data box and raceway, V4000 wiremold, and fittings fire alarm audible/visual notification appliance and visual notification appliance, clocks and speakers, and other common electrical work which may be anticipated for any future revisions. These unit costs, once agreed to, shall be applied to additions and deducts for all project change orders.

3.14 DRAWINGS AND MEASUREMENTS

A. The Drawings are not intended to be scaled for rough-in measurements nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement are the Contractor’s responsibility. The Contractor shall check latest Architectural Drawings and locate light switches from same where door swings are different from Electrical Drawings.

3.15 PROJECT COMMISSIONING

A. Refer to Division 01 “Project Commissioning” and the Commissioning Manual.

B. Purpose: Training, documentation and verification of the operation and functional performance of electrical systems for compliance with the “design intent.”

END OF SECTION

SECTION 26 0519 - CONDUCTORS AND CABLES

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes:

1. Building wires and cables rated 600V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Sections include the following:

1. Division 26 Section “Control-Voltage Electrical Power Cables” for multi-conductor cables for electrical control and communications systems operating at 70V and less.

1.03 ACTION SUBMITTALS

A. Submit letter of compliance (intent) for copper and aluminum building wire.

B. Provide product data for the following:

1. Metal-Clad Cable, Type MC

1.04 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Test Reports.

1.05 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.

PART 2 PRODUCTS

2.01 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

D. Conductor Insulation:

1. Type THHN/THWN-2: Comply with UL 83.

2. Type THW/THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

3. Type XHHW-2: Comply with UL 44.

2.02 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers:

1. AFC Cable Systems

2. Alpha Wire Company

3. American Bare Conductor

4. Belden

5. Encore

6. General Cable

7. Okonite

8. Service Wire Co.

9. Southwire Company

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. Comply with UL 1569.

3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit and multi-circuit with color-coded conductors for branch circuit distribution.

2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

E. Conductors:

1. Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

2. Aluminum, complying with ASTM B 800 and ASTM B 801 for conductors #1 AWG and larger.

F. Ground Conductor: Insulated. Ground conductor sized as indicated on drawings (reduced ground conductor is not acceptable).

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.

2. Type XHHW-2: Comply with UL 44.

H. Armor: Aluminum, interlocked.

I. Jacket: PVC applied over armor.

2.03 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Refer to application schedule on the drawings

B. Feeders and Branch Circuits: Solid or stranded for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

C. Each feeder shall be of the same conductor and insulation material (phase, neutral, and parallel).

D. Use conductor not smaller than 14 AWG for 120V control circuits.

E. Where equipment is listed for use with copper conductors only, use copper conductors for the entire length of feeder.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Refer to application schedule on the drawings

B. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel wire-mesh strain relief device at terminations to suit application.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 0533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

G. Neatly train and lace wiring inside boxes, equipment, and panelboards.

H. Provide a separate neutral conductor for each circuit unless multi-wire branch circuits are specifically indicated on the drawings.

I. Electrical Contractor shall be responsible for de-rating of conductors as required by N.E.C. when more than three current carrying conductors are installed in a single raceway or cable. Neutral conductors shall be considered current carrying conductors.

J. Type MC cable shall be supported and secured at intervals not exceeding 4'-0" in new construction.

K. AC/MC cable shall not be used for home runs to receptacle or distribution panels.

L. Where AC/MC cable is permitted by the specifications, AC/MC cable shall not be bundled.

M. Between support, hangers and termination no more than 3" deflection from the bottom of the cable to a horizontal line between the support/hanger or termination.

N. Do not route conductors across roof without prior approval from engineer.

3.04 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 un-spliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

D. Clean conductor surfaces before installing lugs and connectors.

E. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

F. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and larger.

G. Use piercing connector with insulating covers for conductor splices and taps, 8 AWG and larger only for taps to existing feeders. Do not use piercing connectors in new construction.

H. Use Sta-Kon connectors to terminate stranded conductors #10 AWG and smaller to screw terminals.

I. Use insulated spring wire connectors with plastic caps (wire nuts) for copper conductor splices and taps, 10 AWG and smaller. Push-in style connectors are not permitted.

J. Provide lugs suitable for bussing and conductor material used.

K. Use appropriately sized compression pin adapters to make terminations at equipment where equipment lugs cannot accommodate conductors that are oversized for voltage drop or similar conditions.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 0553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0533 "Raceways and Boxes."

3.07 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping”.

3.08 FIELD QUALITY CONTROL

A. Perform the following field quality control tests in accordance with Division 26 Section “Electrical Testing”.

1. Visual and Mechanical Inspection

a. Inspect cables for physical damage and proper connection in accordance with the one line diagram.

b. Check cable color-coding against project Specifications and N.E.C. requirements.

END OF SECTION

SECTION 26 0526 - GROUNDING AND BONDING

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections include the following:

1. Division 26 Section “Electrical General Requirements”.
2. Division 26 Section “Conductors and Cables”.

1.03 REFERENCES

A. ASTM B 3: Specification for Soft or Annealed Copper Wire.

B. ASTM B 8: Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.

C. ASTM B 33: Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes.

D. ASTM B 187: Specification for Copper, Bus Bar, Rod, and Shapes and General Purpose Rod, Bar, and Shapes.

E. IEEE 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

F. IEEE 142: Grounding of Industrial and Commercial Power Systems.

G. IEEE 1100 – 1992: Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.

H. IEEE C2: National Electrical Safety Code.

I. NETA MTS – 2001: Maintenance Testing Specifications.

J. NFPA 70: National Electrical Code.

K. NFPA 70B: Recommended Practice for Electrical Equipment Maintenance.

L. TIA/EIA 607: Commercial Building Grounding and Bonding Requirements Standard.

M. UL 467: Grounding and Bonding Equipment.

N. UL 486 A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.

O. UL 486B: Wire Connectors for Use with Aluminum Conductors.

1.04 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.

1. Comply with UL 467.

B. Comply with ANSI/IEEE 1100 -1992 “Powering and Grounding Sensitive Electronic Equipment”.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors and Cables:
    a. Refer to Division 26 Section “Conductors and Cables”.
2. Mechanical Connectors:
    a. American Electric-Blackburn.
    b. Burndy.
    c. Chance/Hubbell.
3. Exothermic Connections:
    a. Cadweld.
4. Compression-type Connectors:
    a. Burndy HyGround
    b. Blackburn EZ Ground.
    c. Panduit.

2.02 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, stranded, copper unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.

G. Copper Bonding Conductors: As follows:

1. Bonding Conductor: Stranded copper conductor; size per the NEC.

2. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; size per the NEC.

2.03 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, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected for the specific application per manufacturer's written instructions.

D. Compression-Type Connectors: Pure, wrought copper, per ASTM B187.

PART 3 EXECUTION

3.01 EQUIPMENT GROUNDING

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. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

C. Underground Grounding Conductors: No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

D. In raceways, use insulated equipment grounding conductors. Install equipment grounding conductors in all feeders and circuits. Terminate each end on suitable lugs, bus or bushing.

1. Where existing branch circuits are using conduit as equipment grounding conductor and are extended, provide grounding bushing on existing conduit and provide new equipment grounding conductor with new branch circuit.

E. Install equipment grounding conductors in all feeders and circuits. Terminate each end on suitable lugs, bus or bushing.

F. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

G. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a separate equipment grounding conductor with supply branch-circuit conductors. Bond pole and foundation reinforcing steel to equipment ground conductor.

H. Verify specific equipment grounding requirements with the manufacturer’s recommendations.

3.02 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. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. 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

1. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and larger.

2. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

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 or UL 486B as applicable.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Connections shall be non-reversible. 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.

3.03 INSTALLATION

A. Equipotential Ground: Interconnect grounding electrodes to form one, electrically continuous, equipotential grounding electrode system. Grounding electrodes to be interconnected include:

1. Metal In-Ground Support Structure.

2. Concrete Encased Electrode.

B. Metal in-ground support structure in direct contact with the earth vertically for 10 feet (3.0 m) or more, with or without concrete encasement: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to at least one metal in-ground support structure, or as otherwise indicated. Connect grounding conductors to metal in-ground support structure by exothermic welds. Bond metal grounding conductor conduit or sleeve to conductor at each end.

C. Concrete Encased Electrode: Fabricate in accordance with NFPA 70:

1. Provide a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet long, coil excess conductor within the base of the foundation.

2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts.

3. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

D. 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. Install in conduit where routed above grade.

1. Aluminum and copper-clad aluminum conductors shall not be used in direct contact with masonry, within 18 inches of the earth, or where subject to corrosive conditions.

E. 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 or non-reversing compression-type 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.

F. Equipment Grounding: Provide a permanent and continuous bonding of conductor enclosures, equipment frames, power distribution equipment ground busses, cable trays, metallic raceways, and other non-current carrying metallic parts of the electrical system.

G. Bond together metal building elements not attached to grounded structure; bond to ground.

H. Provide a flexible braid bonding jumper at each set of columns at expansion joints.

3.04 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Manholes and Handholes: Install a driven ground rod close to wall, inside manhole, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG 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 above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

B. Connections to Manhole Components: Connect all 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 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 transformers/substations by connecting them to underground cable and grounding electrodes. Use not less than a No. 2 AWG conductor for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches below grade and 6 inches from the foundation.

3.05 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality control tests in accordance with Division 26 section “Electrical Testing”

1. Inspect grounding and bonding system conductors and connections for tightness and proper installation and for compliance with the Drawings and Specifications.

3.06 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

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.05 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.06 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Allied Tube & Conduit; a part of Atkore International.
    b. B-Line, by Eaton.
    c. GS Metals Corp.
    d. Pentair Electrical & Fastening Solutions.
    e. Thomas & Betts Corporation.
    f. Unistrut; a part of Atkore International.
    g. Wesanco, Inc.
2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) B-Line by Eaton.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.02 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 05 Section "Metal Fabrications" for steel shapes and plates.

2.03 ROOF MOUNTED CONDUIT AND EQUIPMENT SUPPORTS

A. General: Shop- or field- fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted conduit and equipment.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-Line by Eaton; Dura-Blok.
2. MIRO Industries.
3. Pentair Electrical & Fastening Solutions; Caddy Pyramid.
4. Pipe Pier Support Systems; Pipe Piers.

C. Adjustable Compact Stand: Recycled rubber base unit with integral threaded coupling capable of accepting 3/8-16 threaded rod, or 1-5/8 inch by 1-5/8 inch metal strut and various supporting elements.

D. Multiple-Conduit and Equipment Stand: Assembly of bases, vertical and horizontal members, and conduit supports, for roof installation without membrane penetration.

1. Bases: One or more adjustable compact stand bases.
2. Vertical Members: Two or more protective-coated-steel channels.
3. Horizontal Member: Protective-coated-steel channel.
4. Supports: Standard strut clamps, hangers, and accessories.

PART 3 EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (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 these supports with:

a. Two-bolt conduit clamps

b. Single-bolt conduit clamps

c. Single-bolt conduit clamps using spring friction action for retention in support channel.

D. Support single runs of MC cable using spring-steel clamps from suspended ceiling hangers, hanger wire or building structure at intervals not to exceed three feet. Do not support MC cable from ceiling grid.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.

2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.

5. To Steel:

a. Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.

b. Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69

c. Spring-tension clamps.

6. To Light Steel: Sheet metal screws.

7. 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 support systems attached to substrate.

E. Slotted support systems applications:

1. Indoor dry and damp Locations: Painted Steel

2. Outdoors and interior wet locations: Galvanized Steel

F. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

G. Do not fasten supports to floor decks, roof decks, pipes, ducts, mechanical equipment, or conduit.

H. Obtain permission from Architect/Engineer before using powder-actuated anchors.

I. Obtain permission from Architect/Engineer before drilling or cutting structural members.

J. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

K. Install surface-mounted cabinets and panelboards with minimum of four anchors.

L. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch (25 mm) off wall.

M. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

N. The Contractor shall replace all supports and channels that sag, twist, and/or show signs of not providing proper structural support, to the equipment, it is intended for, as determined by the Owner and Architect/Engineer. All costs associated with replacing supports and steel channels shall be incurred by the Contractor.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 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.

3.04 INSTALLATION OF ROOF MOUNTED SUPPORTS

A. Install in accordance with manufacturer’s instructions.

B. If gravel top roof, gravel must be removed around and under support.

C. Consult roofing manufacturer for roof membrane compression capacities. If required, a compatible sheet of roofing material (rubber pad) may be required under rooftop support to disperse concentrated loads and add further membrane protection.

D. Utilize properly sized clamps and accessories to suit conduit sizes.

E. Provide vertical steel channel members as required for elevated conduit supports where required for clearances, coordination with other roof mounted systems or derating.

3.05 CONCRETE BASES

A. Provide concrete bases for all floor mounted electrical equipment.

B. Provide concrete bases for all exterior, grade level electrical equipment, and where indicated.

C. Base/Pad Construction:

1. Construct per manufacturer’s recommendations for particular equipment, including suggested piers and dowel rods.

2. Interior concrete bases shall have a minimum depth of 4” unless other indicated or recommended by the manufacturer.

3. Exterior concrete bases shall have a minimum depth of 8” unless other indicated or recommended by the manufacturer.

4. Construct concrete bases for primary and secondary power distribution equipment per requirements of the electrical utility, where submitted for its review.

D. Anchor equipment to base per both supports and equipment manufacturer’s instructions.

E. Coordinate conduit openings and sleeve locations in base with requirements of equipment to be supported.

3.06 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Division 09 painting Sections, Section "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 0533 - RACEWAYS AND BOXES

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 26 Section, “Underground Ducts and Raceways for Electrical Systems” for exterior duct banks, manholes and underground utility construction.
2. Division 07 Section, “Penetration Firestopping” for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
3. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings, and for access floor boxes and service poles.
4. Division 26 “Hangers and Supports for Electrical Systems” for concrete bases.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

H. PVC: Polyvinyl Chloride.

I. HDPE: High Density Polyethylene.

J. RTRC: Reinforced Thermosetting Resin Conduit

1.04 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.05 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.

1.06 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

2.01 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube Triangle Century.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. International Metal Hose.
6. Electri-Flex Co
7. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
8. LTV Steel Tubular Products Company – Manhattan/CDT/Cole-Flex.
9. Maverick.
10. O-Z Gedney; unit of General Signal.
11. Wheatland.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit, IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

E. EMT: ANSI C80.3.

F. FMC: Zinc-coated steel or Aluminum.

G. LFMC: Flexible steel conduit with PVC jacket.

H. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel, compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch, with overlapping sleeves protecting threaded joints.

2.02 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe and Plastics Group.
6. Condux International.
7. ElecSys, Inc.
8. Electri-Flex Co.
9. Integral.
10. Kor-Kap.
11. Lamson and Sessions: Carlon Electrical Products.
12. Manhattan/CDT/Cole-Flex.
13. RACO; Division of Hubbell, Inc.
14. Scepter.
15. Spiralduct, Inc./AFC Cable Systems, Inc.
16. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

E. LFNC: UL 1660.

F. HDPE: UL 651, ASTM D 3350, ASTM D 1248 Schedule 40.

G. RTRC: Comply with UL 2515A and NEMA TC 14.

2.03 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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.

2.04 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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.

e. Mono-Systems, Inc.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.05 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Shall be used within walls or ceiling.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover. Shall be used in all exposed, non-recessed, locations.

C. Nonmetallic Outlet and Device Boxes: NEMA OS 2. Shall be used in corrosive areas.

D. Floor Boxes: Cast metal, fully adjustable, rectangular.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover. Shall be used in areas exposed to water.

G. 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.

H. 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.

2.06 SLEEVES FOR RACEWAYS

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 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."

2.07 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. 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.
2. Pressure Plates: Plastic. Include two for each sealing element.
3. 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.

2.08 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 EXECUTION

3.01 RACEWAY APPLICATION

A. Provide raceways in interior and exterior locations in accordance with the “Raceway Application Matrix” included on the drawings.

B. Boxes and Enclosures, Exterior Aboveground: NEMA 250, Type 3R.

C. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.

D. Minimum Raceway Size: 3/4-inch trade size.

E. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
3. EMT: Use compression steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

F. Do not install aluminum conduits in contact with concrete.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.02 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Install temporary closures to prevent foreign matter from entering raceways.

F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

G. 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.

H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

I. 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.

J. Support conduit within 12 inches of enclosures to which attached.

K. Raceways Embedded in Slabs:

1. Raceways embedded in slabs shall be limited to above grade concrete decks. Embedded conduit shall be limited to servicing floor boxes and equipment located in open spaces away from accessible walls.

2. Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.

3. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

4. Space raceways laterally to prevent voids in concrete.

5. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

6. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

7. Conduits shall run flat. Do not allow conduits to cross.

8. Change from non-metallic raceway to rigid steel before turning up out of the concrete and rising above the floor.

L. 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.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

S. 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.

T. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

U. Provide pull string and 25% spare capacity in every branch circuit conduit.

V. Communications and Signal Cabling Systems Raceways: In addition to above requirements, install raceways in maximum lengths of 150 feet 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.

1. Electrical condulet (LB’s) are not permitted.
2. Conduits shall have no more than two 90 degree bends between pull points or pull boxes.
3. Conduits shall contain no continuous sections longer than 150 ft. without a pull point/box.
4. Conduit for fiber cabling shall have a bend radius of at least 10 times the internal diameter.
5. Conduit for copper cabling less than 2” shall have a bend radius of at least 6 times the internal diameter. Conduit for copper cabling 2” and larger shall have a bend radius of at least 10 times the internal diameter.
6. All conduit ends shall have an insulated bushing.

W. 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 conduits route through, to, or from a hazardous classified space (Class I or II), provide proper seal offs when exiting or entering the hazardous classified space.
3. Where conduits pass between spaces that are maintained at two different vapor pressures.
4. Where otherwise required by NFPA 70.

X. 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 above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

Y. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg Ftemperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg Ftemperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg Ftemperature change.
    d. Attics: 135 deg Ftemperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Z. Flexible Conduit Connections: Comply with NEMA RV3. Use maximum of 72 inches 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.

AA. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals. Provide cover clips to cover space between connecting pieces.

BB. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

CC. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

DD. Locate boxes so that cover or plate will not span different building finishes.

EE. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

FF. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

GG. Set floor boxes level and flush with finished floor surface. Trim non-metallic boxes after installation to fit flush with finished floor surface.

HH. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

II. Do not route feeders across roof.

JJ. Provide a pull box (a handhole for outdoor applications) for each conduit run that exceeds 250 feet. Provide two pull boxes (handholes for outdoor applications) for runs that exceed 500 feet.

KK. Route conduits in finished areas with exposed ceilings at underside of structural deck or as high as possible.

LL. Outlet boxes within hazardous locations shall be of the proper class and division as noted in the N.E.C.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" for pipe less than 6 inches in nominal diameter.

2. Install backfill as specified in Division 2 Section "Earthwork."

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork."

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

   b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

5. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits, placing them 24 inches o.c. Align planks along the width and along the centerline of conduit.

3.04 SLEEVE INSTALLATION FOR ELECTRICAL AND COMMUNICATIONS PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Through-Penetration Firestop Systems."

B. 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.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.

2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

E. 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.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

G. Extend sleeves installed in floors 2 inches above finished floor level.

H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."

L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.05 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.06 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Through-Penetration Firestop Systems."

3.07 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.

3.08 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

SECTION 26 0553 - ELECTRICAL IDENTIFICATION

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

1.04 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.05 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

2.01 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.

2.02 CONDUCTOR, COMMUNICATION AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.03 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.04 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. 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."

2.05 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. Black letters on a white background. Minimum letter height shall be 3/8 inch.

B. Outdoor Equipment Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.06 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.
2. Tensile Strength: 50 lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

2.07 WIRING DEVICE IDENTIFICATION

A. Description: Self adhesive label with black upper case letters on clear polyester label, font size 7.

PART 3 EXECUTION

3.01 APPLICATION

A. Accessible Raceways and Metal-Clad Cables More Than 600 V: Identify with "DANGER-HIGH VOLTAGE" in black letters at least 2 inches high, with self-adhesive vinyl labels. Repeat legend at 10-foot maximum intervals.

B. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service and Feeders More Than 400 A: Identify with orange self-adhesive vinyl label.

C. 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. Security System: Blue and yellow.
3. Telecommunication System: Green and yellow.
4. Control Wiring: Green and red.

D. Power-Circuit Conductor Identification: For conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape and marker tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

E. 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 as indicated on Drawings. Identify control circuits by control wire number as indicated on shop drawings.

F. Branch-Circuit Conductor Identification: Mark junction box covers in indelible ink with the panel and breaker numbers of other circuits contained within.

G. Conductor Identification: Locate at each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection or termination point.

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- 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 mechanically secured.
    b. Outdoor Equipment: Stenciled.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
2. Equipment to Be Labeled: If included on project. All items may not be on project.
    a. Panelboards, electrical cabinets, and enclosures.
    b. Access doors and panels for concealed electrical items.
    c. Electrical switchgear and switchboards.
    d. Transformers.
    e. Electrical substations.
    f. Emergency system boxes and enclosures.
    g. Motor-control centers.
    h. Disconnect switches.

i. Enclosed circuit breakers.

j. Motor starters.

k. Variable Frequency Controllers

l. Push-button stations.

m. Power transfer equipment.

n. Contactors.

o. Remote-controlled switches, dimmer modules, and control devices.

p. Battery inverter units.

q. Battery racks.

r. Power-generating units.

s. Voice and data cable terminal equipment.

t. Master clock and program equipment.

u. Intercommunication and call system master and staff stations.

v. Television/audio components, racks, and controls.

w. Fire-alarm control panel and annunciators.

x. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.

y. Monitoring and control equipment.

z. Uninterruptible power supply equipment.

aa. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

bb. Breakers or switches at distribution panels.

M. Wiring Device Identification Labels: On each faceplate install circuit designation label that is consistent with panelboard directories, and as-built plan drawings. Apply labels to receptacle faceplates centered below bottom outlet. Apply labels to toggle switch faceplates on backside.

3.02 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location:

1. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

2. Conduit Markers: Provide identification for each power conduit containing conductors rated 400A or greater.

C. Apply identification devices to surfaces 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 maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. 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 208/120-V Circuits:
    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.
    d. Grounded Conductor (Neutral): White.
3. Colors for 480/277-V Circuits:
    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.
    d. Ground Conductor (Neutral): Grey.
4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

I. Label information arrangement for 3 lines of text.

1. Line one shall describe the panel or equipment. Line one example: “DP-XX,” RP-XX,” “T-XX,” “EF-XX,” etc.
2. Line two shall describe the first disconnecting means feeding this panel or equipment. Line two example: “Fed from DP-XX,” “Fed from RP-XX,” etc.
3. Line three indicates that location of the disconnecting means as identified in line two. Line three example: “First Floor Elect. Rm #XXX.”
4. Line four shall include “Via T-XX” when panel or equipment is fed from a transformer.

J. Examples:

RP-1A FED FROM DP-1A ELECTRICAL ROOM A100 VIA T-1A	EF-1 FED FROM MCC-1A MECHANICAL ROOM F101	LP-1A LOCATED IN ELECTRICAL ROOM A100

K. Fusible Enclosed Switches and Distribution Equipment: Install self-adhesive vinyl label indicating fuse rating and type on the outside of door on each fused switch.

L. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

M. Degrease and clean surface to receive nameplates.

N. Install nameplate and labels parallel to equipment lines.

O. Secure nameplate to equipment front using screws.

P. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

Q. Identify conduit using field painting where required.

R. Paint red colored band on each fire alarm conduit and junction box.

S. Paint bands 10 feet on center, and 4 inches minimum in width.

END OF SECTION

SECTION 26 2726 - WIRING DEVICES

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Single and duplex receptacles
2. Ground-fault circuit interrupter receptacles
3. Device wall plates.

1.03 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. AFCI: Arc-fault circuit interrupter.

D. PVC: Polyvinyl chloride.

E. RFI: Radio-frequency interference.

F. SPD: Surge protective devices.

G. UTP: Unshielded twisted pair.

H. USB: Universal serial bus.

1.04 REFERENCES

A. DSCC W-C-596G: Federal Specification Connector, Electrical, Power, General Specification.

B. DSCC W-C-896F: Federal Specification Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification).

C. IEC 309-1, Part 1: General Requirements: Plugs, Socket-Outlets and Couplers for Industrial Purposes

D. NEMA FB 11: Plugs, Receptacles, and Connectors of the Pin and Sleeve Type for Hazardous Locations.

E. NEMA WD 1: General Requirements for Wiring Devices.

F. NEMA WD 6: Wiring Device – Dimensional Requirements.

G. UL 20: General-Use Snap Switches.

H. UL 486A: Wire Connectors and Soldering Lugs for Use with Copper Conductors.

I. UL 486B: Wire Connectors for Use with Aluminum Conductors.

J. UL 498: Electrical Attachment Plugs and Receptacles.

K. UL 943: Ground Fault Circuit Interrupters.

L. NECA 130-2010: Installing and Maintaining Wiring Devices.

1.05 ACTION SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations for each type of product indicated.

1.06 INFORMATIONAL SUBMITTALS

A. Field quality control test reports

1.07 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and source.

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.

1.08 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 PRODUCTS

2.01 GENERAL WIRING DEVICE REQUIREMENTS

A. Comply with NFPA 70, NEMA WD 1, NEMA WD 6, and UL498.

B. Devices for Owner-Furnished Equipment:

1. Receptacles: Match plug configurations.

2. Cord and Plug Sets: Match equipment requirements.

C. Device Color:

1. Wiring Devices Connected to Normal Power System not controlled receptacle: Ivory, unless otherwise indicated or required by NFPA 70 or device listing.

2. Wiring Devices Connected to Normal Power System controlled receptacle: Gray, unless otherwise indicated or required by NFPA 70 or device listing.
3. Wiring Devices Connected to Emergency Power System: Red.
4. Wiring Devices Connected to Optional Standby Power System: Red.
5. Wall Switches: Ivory, unless otherwise indicated.

2.02 STANDARD GRADE RECEPTACLES

A. Duplex Receptacle, NEMA 5-20R:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Tamper-Resistant Duplex Receptacle, NEMA 5-20R:
1. Safety mechanism to energize contacts only when both openings are simultaneously engaged.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hubbell Wiring Device-Kellems: 5362TR
   b. Eaton/Arrow Hart Wiring Devices: AHTR5362
   c. Leviton: 5362-SG
   d. Legrand, Pass & Seymour: TR5362

C. Weather- and Tamper-Resistant Duplex Receptacle, NEMA 5-20R:
1. Safety mechanism to energize contacts only when both openings are simultaneously engaged.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hubbell Wire Device-Kellems: BR20WRTR
   b. Eaton/Arrow Hart Wiring Devices: TWRBR20
   c. Leviton: TWR20
   d. Legrand, Pass & Seymour: WR5352TR

2.03 GFCI RECEPTACLES

A. General:
1. Comply with UL 943

B. Tamper-Resistant Duplex GFCI Receptacle, NEMA 5-20R:
1. Safety mechanism to energize contacts only when both openings are simultaneously engaged.
2. Manufacturers: Subject to compliance with requirements, provide one of the following:
   a. Hubbell Wiring Device-Kellems: GFTRST20
   b. Eaton/Arrow Hart Wiring Devices: TRSGF20
   c. Leviton: GFTR2
   d. Legrand, Pass & Seymour: 2097TR

C. Tamper- and Weather-Resistant Duplex GFCI Receptacle, NEMA 5-20R:

1. Safety mechanism to energize contacts only when both openings are simultaneously engaged.
2. Manufacturers: Subject to compliance with requirements, provide one of the following:
    a. Hubbell Wiring Device-Kellems: GFTWRST20
    b. Eaton/Arrow Hart Wiring Devices: TWRSGF20
    c. Leviton: GFWT2
    d. Legrand, Pass & Seymour: 2097TRWR

D. Dead Front GFCI, 20A:

1. Manufacturers: Subject to compliance with requirements, provide one of the following:
    a. Hubbell Wiring Device-Kellems: GFBFST20
    b. Eaton/Arrow Hart Wiring Devices: SGF20
    c. Leviton: GFRBF
    d. Legrand, Pass & Seymour: 2087.
    e.

2.04 CORD AND PLUG SETS

A. Match voltage and current ratings and number of conductors to requirements of equipment being connected.

B. 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.

C. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.05 WALL PLATES

A. Manufacturers:

1. Provide wall plates and corresponding wiring devices from same manufacturer.

B. 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:
    a. Smooth, high-impact thermoplastic, color to match wring device.
3. Material for Unfinished Spaces:
    a. Smooth, high-impact thermoplastic, color to match wiring device.
4. Material for Wet Locations: Gasketed Cast aluminum with hinged cover and listed and labeled as Extra Duty Weatherproof While-In-Use.
    a. Manufacturers:
        1) Hubbell: MX3200
        2) Red Dot Model: CKLSVU, Thomas & Betts
        3) Intermatic: WP3110MXD

4) Leviton: IUM1V

5. Material for Damp Locations: Gasketed Cast aluminum with hinged cover and listed and labeled as Weatherproof.

a. Manufacturers:

1) Red Dot Model CCGV, ABB Installation Products

2) Eaton/Arrow Hart WLRD1

3) Legrand, Pass & Seymour

4) Intermatic: WP3110MXD

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Prior to installation of devices, verify wall openings are neatly cut and will be completely covered by wall plates, clean debris from outlet boxes and provide extension rings to bring outlet boxes flush with finished surface.

C. Install devices and assemblies level, plumb, and square with building lines.

D. Arrangement of Devices:

1. Coordinate locations of outlet boxes provided under Division 26 Section "Raceways and Boxes" to obtain mounting heights indicated on Drawings.

2. Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top.

3. Where multiple receptacles, switches, dimmers, and/or occupancy sensors are adjacent to each other, provide a single cover plate. Custom fabricate, if required, for all combinations. Provide separate boxes or barriers as required for the application.

4. Install horizontally mounted receptacles with grounding pole on the left.

5. Install GFCI receptacles so that the "Push To Test" and "Reset" designations can be read correctly. If printed in both directions, install with ground pole on top.

6. Install switches with OFF position down.

E. Install cover plates on switch, receptacle, and blank outlets in finished areas.

F. Install weather-resistant type receptacles in all damp and wet locations, including pool environments.

G. Install weatherproof cover plates on receptacles in damp locations.

H. Install weatherproof While-In-Use cover plates on receptacles in wet locations.

I. Install tamper-resistant type receptacles in all locations as required by the NEC (406.12) and as indicated on plan.

J. Use oversized plates for outlets installed in masonry walls.

K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

L. Remove wall plates and protect devices and assemblies during painting.

M. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

N. Adjust devices and wall plates to be flush and level. Three corners of wall plates must be in contact with wall surfaces. Devices shall be solidly mounted against the box.

3.02 IDENTIFICATION

A. Comply with Division 26 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use adhesive label as specified in Division 26 Section “Electrical Identification” with black-filled lettering on face of wall plate, and durable wire markers or tags inside outlet boxes.

2. Wall Switches: Identify panelboard and circuit number from which served. Use adhesive label as specified in Division 26 Section “Electrical Identification” with black-filled lettering on back side of wall plate, and durable wire markers or tags inside outlet boxes.

3.03 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding." Connect wiring device grounding terminal to outlet box with bonding jumper. Use of quick ground strap or screw is not acceptable.

B. Connect wiring according to Division 26 Section "Conductors and Cables." Connect wiring devices by wrapping conductor around screw terminal or by using back wiring and tightening the screw securely.

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.

3.04 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Inspect each wiring device for defects.

2. Operate each wall switch with circuit energized and verify proper operation.

3. After installing wiring devices and after electrical circuitry has been energized, test each receptacle for proper polarity, ground continuity, and compliance with requirements.

4. Test each GFCI receptacle for proper operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION

SECTION 26 5119 - LED INTERIOR LIGHTING

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

1.03 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lamp: LED and substrate as a replaceable assembly.

F. LED: Light-emitting diode.

G. Lumen: Measured output of lamp and luminaire, or both.

H. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.04 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 per 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 or certified by a qualified independent testing agency.

1.05 INFORMATIONAL SUBMITTALS.

A. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Sample warranty.

1.06 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.

1.07 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: 5% attic stock of each type and rating installed. Furnish at least one of each type.
2. LED Drivers 5% attic stock of each type and rating installed. Furnish at least one of each type.
3. Diffusers and Lenses: 1% attic stock of each type and rating installed. Furnish at least one of each type.
4. Globes and Guards: 5% attic stock of each type and rating installed. Furnish at least one of each type.

1.08 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. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

D. 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.

E. Comply with:

1. NFPA 70 - National Electrical Code.
2. NECA/IESNA 500-1998 – Recommended Practice for Installing Indoor Commercial Lighting Systems.
3. NECA/IESNA 502-1999 – Recommended Practice for Installing Industrial Lighting Systems.
4. Code of Federal Regulations (47 CFR 37342).
5. .
6. Michigan Department of Community Industry Services requirements that all lamps shall be protected from breakage. Exposed lamps are not acceptable.

F. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

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.

B. Warranty Period: Five year(s) or manufacturer’s standard warranty length (whichever is longer) from date of Substantial Completion.

PART 2 PRODUCTS

2.01 LUMINAIRES (LIGHTING FIXTURES)

A. Provide Luminaires as indicated on drawings.

2.02 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. Unless otherwise specified in Luminaire product data, provide products with a minimum CRI of 80.

D. Unless otherwise specified in Luminaire product data, provide products with a CCT of 50000 K.

E. Unless otherwise specified in Luminaire product data, provide products with an IES LM-80 rated lamp life of 50,000 hours.

F. Driver

1. Provided as an integrated component of the luminaire or as an external component of an assembly of luminaries.

2. Nominal Input Voltage: All drivers shall be rated for use on either 120V or 277V systems.

2.03 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. 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.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Factory-Applied Labels: Comply with UL 1598 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.

2.04 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.

2.05 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: Unless otherwise specified in Luminaire product data, provide products with a minimum 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: Unless otherwise specified in Luminaire product data, provide products with a minimum ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: Unless otherwise specified in Luminaire product data, provide products with a minimum 3/16-inch 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

3.01 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.

3.02 TEMPORARY LIGHTING

A. Do not use permanent luminaires for temporary lighting.

3.03 INSTALLATION

A. Install in accordance with manufacturer’s instructions and N.E.C.A./I.E.S.N.A. 500-2006 and 502-2006.

B. Install recessed luminaires to permit removal from below.

C. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

D. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

E. Install fixture with no gaps between adjacent fixtures or between fixtures and surrounding surfaces. Trims of fixtures shall be properly and uniformly aligned.

F. 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.

G. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

H. Comply with requirements in Section 26 0519 "Conductors and Cables" for wiring connections.

I. Fixtures shall have their exterior labels removed and shall be thoroughly cleaned.

J. Locate the remote test/monitor modules identically so that they are visible and they form a straight line when viewed from the end of the corridor or room. Where a suspended ceiling exists, center the modules in adjacent ceiling tiles.

3.04 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 wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

C. Bond products and metal accessories to branch circuit equipment grounding conductor.

D. Connect luminaires to branch circuit outlet boxes provided under Division 26 Section "Raceways and Boxes" using 1/2" flexible conduit.

3.05 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.06 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.

D. A visual inspection shall be performed to verify cleanliness and alignment of the fixtures, misalignment and light leaks shall be corrected, and rattles due to ventilation system vibration shall be eliminated.

3.07 STARTUP SERVICE

A. Comply with requirements for startup specified in Division 26 Section "Lighting Control Systems."

3.08 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, drivers, 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.

B. Adjust exit sign directional arrows as indicated on Drawings.

C. Adjust and calibrate all dimming system controls until the system works as designed. Contact the Architect/Engineer when dimming is complete and demonstrate operation to owner’s representative and Architect/Engineer.

3.09 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosures and lenses.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

END OF SECTION

SECTION 26 5600 - EXTERIOR LIGHTING

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PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Exterior luminaires with LEDs and drivers.
2. Poles and accessories.

B. Related Sections include the following:

1. Division 26 Section "LED Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.

1.03 DEFINITIONS

A. CRI: Color-rendering index.

B. Luminaire: Complete lighting fixture, including ballast housing if provided.

C. Pole: Luminaire support structure, including tower used for large area illumination.

D. Standard: Same definition as "Pole" above.

1.04 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4.

B. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4.

C. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.

1. Wind speed for calculating wind load for poles 50 feet or less in height is 110 mph.

1.05 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.

2. Details of attaching luminaires and accessories.

3. Details of installation and construction.

4. Luminaire materials.

5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.

a. Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Drivers, including energy-efficiency data.

7. LED’s, including life, output, and energy-efficiency data.

8. Materials, dimensions, and finishes of poles.

9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

10. Anchor bolts for poles.

B. Shop Drawings:

1. Anchor-bolt templates keyed to specific poles and certified by manufacturer.

2. Wiring Diagrams: Power wiring.

1.06 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4 and that load imposed by luminaire has been included in design.

B. Qualification Data: For agencies providing photometric data for lighting fixtures.

C. Field quality-control test reports.

1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

B. Warranty: Special warranty specified in this Section.

1.08 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

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 IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

B. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period.

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.

2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.

3. Warranty Period for Color Retention: Five years from date of Substantial Completion.

4. Warranty Period for LEDs: Replace LEDs and fuses that fail within 5 years from date of Substantial Completion.

5. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than five years from date of Substantial Completion.

1.11 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. LED Drivers 5% attic stock of each type and rating installed. Furnish at least one of each type.

PART 2 PRODUCTS

2.01 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. Basis of Design Product: The design of each item of exterior luminaire and its support is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.02 LUMINAIRES, GENERAL REQUIREMENTS

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. 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. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. 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.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. 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.

2.03 POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-4.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

2.04 STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; 1-piece construction up to 40 feet in height with access handhole in pole wall.

1. Mounting Provisions: Butt flange for bolted mounting on foundation..

B. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.

2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.

3. Match pole material and finish.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 26 Section "Grounding and Bonding," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.

F. Factory-Painted Finish: 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, "Solvent Cleaning," 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, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.

3. 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..

2.05 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

B. Vibration Dampener: For all steel and aluminum lighting poles taller than 25’, provide factory installed vibration dampening device to eliminate second mode or higher resonance that can occur with low velocity steady state winds.

2.06 REQUIREMENTS FOR INDIVIDUAL EXTERIOR LIGHTING DEVICES

A. Provide Luminaires as included in specification 26 5700 “Luminaire Product Data.” This section contains product data sheets from the basis of design manufacturer with annotations.

B. Acceptable alternate manufacturers are indicated on the product data sheets. Alternate manufacturer products shall be equal in all respects including materials, finishes, photometric performance and energy performance and shall include all options, features, and accessories identified.

C. The Luminaire schedule shown on the drawings is supplemental provided for convenience and reference only. The requirements of this section and 26 5700 shall govern.

PART 3 EXECUTION

3.01 LUMINAIRE INSTALLATION

A. Install exterior lighting system per N.E.C.A./I.E.S.N.A. 501-2006.

B. Fasten luminaire to indicated structural supports.

C. Adjust luminaires that require field adjustment or aiming.

3.02 POLE INSTALLATION

A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features, unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
3. Trees: 15 feet.

C. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

1. Install base covers, unless otherwise indicated.

D. Raise and set poles using web fabric slings (not chain or cable).

3.03 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 Division 26 Section "Raceways and Boxes." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.04 GROUNDING

A. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding."

3.05 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

END OF SECTION

SECTION 31 1000 - SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Protecting existing vegetation to remain.
   2. Removing above- and below-grade site improvements.
   3. Temporary erosion and sedimentation control.

1.02 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.03 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where directed by Owner. Refer to plans for irrigation components to be salvaged to Owner.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 01 5639 "Temporary Tree and Plant Protection."

C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.03 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction.

3.04 EXISTING UTILITIES

A. Locate, identify, and protect all site utilities.

3.05 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 4-inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.06 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Sawcut existing pavements at removal limits, or further as required for stable edge condition matching existing jointing. Protect sawcut edges after removals or, if damaged, provide new sawcut immediately prior to installation of new work.

3.07 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 1000

SECTION 31 2000 - EARTH MOVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Excavating and backfilling.

1.03 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

B. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

C. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

D. Fill: Soil materials used to raise existing grades.

E. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
   1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom; measured according to SAE J-1179.
   2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

H. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

I. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.04 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.

B. Shop Drawings: Location and dimensions of Contractor's proposed bore pits.

C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.05 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify "Miss Dig" for area where Project is located before beginning earth moving operations.

C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 31 1000 "Site Clearing," are in place.

D. Do not commence earth moving operations until plant-protection measures specified in Section 01 5639 "Temporary Tree and Plant Protection" are in place.

E. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Engineered Fill: MDOT Class II granular material

E. Bituminous Pavement Sub-base: MDOT Class II granular material

F. Bituminous Pavement Base: MDOT 21AA Limestone

G. Concrete Pavement Base: MDOT 21AA Limestone

2.02 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Survivability: As follows:
      a. Grab Tensile Strength: 157 lbf; ASTM D 4632.
      b. Sewn Seam Strength: 142 lbf; ASTM D 4632.
      c. Tear Strength: 56 lbf; ASTM D 4533.
      d. Puncture Strength: 56 lbf; ASTM D 4833.
   3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
   4. Permittivity: 0.5 per second, minimum; ASTM D 4491.
   5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Survivability: As follows:
      a. Grab Tensile Strength: 247 lbf; ASTM D 4632.
      b. Sewn Seam Strength: 222 lbf; ASTM D 4632.
      c. Tear Strength: 90 lbf; ASTM D 4533.
      d. Puncture Strength: 90 lbf; ASTM D 4833.
   3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
   4. Permittivity: 0.02 per second, minimum; ASTM D 4491.
   5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

C. Geogrid
   1. Between the Aggregate Base and Granular Base:

a. Tensar NX 750 or equivalent
2. Between the Granular Base and Compacted Subgrade:
a. Tensar NX 850 or equivalent

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DEWATERING

A. Groundwater and surface water which is free of contamination and sediment may be discharged to a storm drain. Drains must be protected from sediment by using filter fabric or silt sacks. However, if field indicators indicate possible contamination the water cannot be discharged. Note: suspect contaminated groundwater may exhibit chemical or unusual odors, unusual coloring, sheen, and/or contain man-made debris.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 EXPLOSIVES

A. Explosives: Do not use explosives.

3.04 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction.

B. Suspect Contaminated Soil, Groundwater, or other Unknown Material:
1. During work activities if suspect contaminated soil, groundwater, or other unknown material is encountered contact the Owner immediately. Suspect contaminated soil may exhibit chemical or unusual odors, staining, unusual coloring, and/or contain man-made debris. Suspect contaminated groundwater may exhibit chemical or unusual odors, unusual coloring, and/or sheen.

2. Immediately cease all excavation, dewatering, transport, or disturbance of the suspect material until given direction by the Owner.

3.05 BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Backfill voids with satisfactory soil while removing shoring and bracing.

C. Place and compact backfill of subbase material, free of particles larger than 1 inch in any dimension, in maximum 4-inch lifts.

D. Place and compact final backfill of 6-inch topsoil lift to final subgrade elevation.

3.06 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.07 COMPACTION OF BACKFILLS

A. Place backfill and fill soil materials in layers not more than 6 inchesin loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
1. Under structures, foundations and building slabs, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 98 percent.
2. Under paved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.

D. Compact base materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
1. Under structures, foundations and building slabs, compact each layer of base material in maximum 6-inch lefts at 98 percent.
2. Under paved areas, compact each layer of base material in maximum 6-inch lefts at 98 percent.

3.08 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

3.09 GEOGRID INSTALLATION

A. Place geogrid promptly according to manufacturer's written instructions. Overlap longitudinal and transverse joints per manufacturer’s recommendations.

B. Do not let geogrid be exposed to sunlight for more than 500 hours prior to burying.

3.10 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
   2. Determine that fill material and maximum lift thickness comply with requirements.
   3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.11 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.12 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including topsoil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 2000

SECTION 32 1216 - ASPHALT PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
1. Cold milling of existing asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt overlay.

B. Related Requirements:
1. Section 31 1000 "Site Clearing" for demolition and removal of existing asphalt pavement.
2. Section 31 2000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
3. Section 32 1373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

1.03 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.

B. Samples for Verification:
1. GeoGrid

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Material Certificates: For each paving material.

C. Material Test Reports: For each paving material, by a qualified testing agency.

D. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by MDOT.

B. Testing Agency Qualifications: Qualified according to ASTM D3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of MDOT for asphalt paving work.
   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.06 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. Tack Coat: Minimum surface temperature of 60 deg F.
   2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
   3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D1073, 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 D242/D242M, rock or slag dust, hydraulic cement, or other inert material.

2.02 ASPHALT MATERIALS

A. Asphalt Binder: ASTM D6373 binder designation PG 64-22.

B. Tack Coat: ASTM D977 emulsified asphalt, or ASTM D2397/D2397M cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

C. Water: Potable.

D. Undersealing Asphalt: ASTM D3141/D3141M; pumping consistency.

2.03 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material.

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 D1073, 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 D6690, Type IV, hot-applied, single-component, polymer-modified bituminous sealant.

2.04 MIXES

A. Recycled Asphalt Content:
   1. May be permitted in percentages in accordance with MDOT guidelines and specifications for use in the surface course mix design.

B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by MDOT and complying with the following requirements:
   1. Leveling Course: MDOT 13A or MDOT 4EML
   2. Surface Course: MDOT 13A or MDOT 4EML

2.05 GEOGRID

A. Between the Aggregate Base and Granular Base:
   1. Tensar NX 750 or equivalent

B. Between the Granular Base and Compacted Subgrade:
   1. Tensar NX 850 or equivalent

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

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

3.02 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.

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.
   2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
   3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.03 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
   1. Mill to a depth as indicated on the drawings.

2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Patch surface depressions deeper than 1 inch after milling, before wearing course is laid.
7. Handle milled asphalt material according to approved waste management plan required in Section 01 7419 "Construction Waste Management and Disposal."
8. Keep milled pavement surface free of loose material and dust.
9. Do not allow milled materials to accumulate on-site.

3.04 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 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. Undersealing: 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..
   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.

3.05 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 in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth as indicated on the drawings.
   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 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 wide. Fill flush with surface of existing pavement and remove excess.

3.06 SURFACE PREPARATION

A. 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.. 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. 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..
   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.

3.07 GEOGRID INSTALLATION

A. Place geogrid promptly according to manufacturer's written instructions. Overlap longitudinal and transverse joints per manufacturer’s recommendations.

B. Do not let geogrid be exposed to sunlight for more than 500 hours prior to burying.

3.08 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.
   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 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 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.

3.09 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.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
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.

3.10 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.

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 D6927 or AASHTO T 245, but not less than 94 percent or greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D2041/D2041M, 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.

3.11 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base and Leveling Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, 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 straightedge applied transversely or longitudinally to paved areas:
   1. Base and Leveling Course: 1/4 inch.
   2. Surface Course: 1/8 inch.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

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 of height indicated above pavement surface.

3.12 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. 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 D3910 and allow to cure.
   1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will 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 D3549/D3549M.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D979/D979M or AASHTO T 168.
   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 D2041/D2041M, and compacted according to job-mix specifications.
   2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D1188 or ASTM D2726/D2726M.
      a. One core sample will be taken for every 1000 sq. yd. 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 D2950 and correlated with ASTM D1188 or ASTM D2726/D2726M.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.14 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 01 7419 "Construction Waste Management and Disposal."

END OF SECTION 32 1216

SECTION 32 1313 - CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Concrete sidewalks and pavements.

B. Related Sections:
   1. Section 32 1373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.04 ACTION SUBMITTALS

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

B. Shop Drawings: As required in project documents.

C. Other Action Submittals:
   1. Design Mixtures: For each concrete paving and curb mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer.

B. Material Certificates: For the following, from manufacturer:
   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Fiber reinforcement.
   4. Admixtures.
   5. Curing compounds.
   6. Applied finish materials.
   7. Bonding agent or epoxy adhesive.
   8. Joint fillers.

C. Shop Drawings: For layout and cutting of Detectable Warning Tiles at each sidewalk ramp.

D. Field quality-control reports.

1.06 QUALITY ASSURANCE

A. Ready-Mix-Concrete 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" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. ACI Publications: Comply with ACI 301unless otherwise indicated.

1.07 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.01 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
   1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.02 STEEL REINFORCEMENT

A. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from galvanized-steel wire into flat sheets.

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

D. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

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

F. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

G. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

H. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

I. Plain-Steel Wire: ASTM A 82/A 82M, galvanized.

J. Deformed-Steel Wire: ASTM A 496/A 496M.

K. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, deformed.

L. Dowel Placement System: Speed Dowel by Sika Greenstreak, or approved equal.

M. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

N. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.

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

P. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

Q. 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" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

R. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

S. Zinc Repair Material: ASTM A 780.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
1. Portland Cement: ASTM C 150, gray portland cement Type I/II. Mix designs may be supplemented with the following subject to Architect’s review and approval:
a. Fly Ash: ASTM C 618, Class C or Class F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
2. Blended Hydraulic Cement: ASTM C 595, Type IP, portland-pozzolan cement.

B. Normal-Weight Aggregates: ASTM C 33, , uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 1 inchnominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures 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.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2.04 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 incheslong.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Monofilament Fibers:
         1) Axim Italcementi Group, Inc.; FIBRASOL II P.
         2) Euclid Chemical Company (The), an RPM company; Fiberstrand 100, Fiberstrand 150.
         3) Grace, W. R. & Co. - Conn.; Grace MicroFiber.
         4) Metalcrete Industries; Polystrand 1000.
         5) QC Construction Products; QC FIBERS.

2.05 CURING MATERIALS

A. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.06 CONCRETE SEALER

A. Apply a 100% silane or siloxane, penetrating concrete sealer per manufacturer's recommendations. The concrete should be reasonably dry prior to the sealer application, to properly absorb the sealer. Ensure joints have been cleaned and sealed at the same time. Manufacturer products, or approved equal, include:
   1. MasterProtect H 1000, 200 sf/gal, BASF.
   2. Iso-Flex 618-100 RFS, 200 sf/gal, Lymtal.
   3. Protectosil BHN, 200 sf/gal, Evonik Corp.
   4. Sikagard 705:, 200 sf/gal, Sika.
   5. Sil-Act ATS-100LV, 200 sf/gal, ACT.

2.07 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.08 DETECTABLE WARNING MATERIALS

A. Detectable Warning Tile: Cast-in-place ADA compliant truncated dome warning tiles as manufactured by Engineered Plastics, Inc., Williamsville NY, (800) 682-2525. Tiles shall be as follows:

   1. Product: Armor-Tile Cast-in-Place System
   2. Size: 24-inch x 24-inch, square
   3. Color: Brick Red

2.09 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.

2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete 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

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
1. Air Content: 6 percent plus or minus 1.0 percent for 1-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage by weight of cementitious materials other than portland cement according to ACI 301requirements as follows:
1. Fly Ash or Pozzolan: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

G. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.

2.10 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.
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.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Test subgrades and subbase for specified compaction.

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

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 STEEL REINFORCEMENT

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

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Reinforcement shall be held in place by chairs, spacers, or other devices commercially manufactured specifically for that purpose. Bricks, blocks, rocks, or use of other construction debris will not be accepted. Hooking or pulling reinforcement into place will not be allowed.

E. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

3.05 JOINTS

A. General: Form expansion, isolation, and control joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
   1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Expansion Joints: Set expansion joints at locations indicated on plans.
   1. Locate expansion joints as indicated on the drawings.
   2. Install dowel bars and support assemblies at joints where indicated. Use speed dowel assemblies to prevent concrete bonding to one side of joint.
   3. Extend joint fillers full width and depth of joint.
   4. Terminate joint filler at height indicated on plans to allow for installation of joint sealant.
   5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
   1. Locate isolation joints as indicated on the drawings.
   2. Extend joint fillers full width and depth of joint.
   3. Terminate joint filler at height indicated on plans to allow for installation of joint sealant.
   4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

D. Control Joints: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/8-inchradius. Repeat grooving of control joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inchradius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. 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.

G. Consolidate concrete according to ACI 301by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating joint devices.

H. Screed paving surface with a straightedge and strike off.

I. 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.

J. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
1. When air temperature has fallen to or is expected to fall below 40 deg F uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg Fand not more than 80 deg Fat point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

K. Hot-Weather Placement: Comply with ACI 301and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg Fat time of placement. Chilled mixing water or chopped ice may be used to control temperature,

provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.07 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-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.

3.08 DETECTABLE WARNING MATERIALS

A. General: Installation shall conform to city standards, approved shop drawings, and manufacturer’s directions.

B. Cutting: Tiles shall be cut according to approved shop drawings prior to installation. Cuts shall be straight and free of burrs, notches, and other irregularities. Cuts for detectable warning tiles along curb radii shall result in uniform pie shape pieces with cuts on joining sides of every tile.

C. Installation: Cast tiles into concrete per manufacturer’s directions.

3.09 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.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 curing compound as follows:

1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.10 CONCRETE WASHOUT

A. Do not discharge concrete washout into storm drains, catch basins or to the sanitary sewer system. Perform washing of concrete trucks in designated areas or an approved offsite location.
   1. Designated areas should be clearly labeled. They should be in a pit to prevent run-off of waste water. Place designated areas a minimum of 50 feet from storm drains, bodies of water and ditches. All designated areas should be lined to prevent seepage and should have a barrier.
   2. Alternative to a designated area: Provide a concrete box. If only a small amount of concrete washing is to occur, one option is to line a roll-off box. For very small projects this could be done with a drum.

B. Once concrete washout has hardened, break up and dispose of properly. Disposal of hardened concrete should occur on a regular basis.

C. Washout facilities must be cleaned, or new facilities provided once the washout area is 75% full.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least one composite sample for each ready mix loador fraction thereof of each concrete mixture placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg Fand below and when it is 80 deg Fand above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
      a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

3.13 WASTE MANAGEMENT

A. Separate and recycle waste materials, packaging, and all other materials in accordance with the Waste Management Plan and to the maximum extent possible, send to reuse or recycle centers.

B. Concrete Washout:
   1. Do not discharge concrete washout into storm drains, catch basins or to the sanitary sewer system. Perform washing of concrete trucks in designated areas or offsite.
      a. Designated areas should be clearly labeled. They should be in a pit to prevent run-off of waste water. Place designated areas a minimum of 50 feet from storm drains, bodies of water and ditches. All designated areas should be lined to prevent seepage and should have a barrier.
      b. Alternative to a designated area: Provide a concrete box. If only a small amount of concrete washing is to occur, one option is to line a roll-off box. For very small projects this could be done with a drum.
   2. Once concrete washout has hardened, break up and dispose of properly. Disposal of hardened concrete should occur on a regular basis.

C. Washout facilities must be cleaned, or new facilities provided once the washout area is 75% full.

END OF SECTION 32 1313

SECTION 32 1373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section applies to areas outside building footprint and includes:
   1. Cold-applied joint sealants.
   2. Hot-applied joint sealants.

1.02 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers samples of materials that will contact or affect joint sealants. Use ASTM C 1087 manufacturer's standard test method to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

1.03 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each kind and color of joint sealant required.

C. Pavement-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.

D. Product certificates.

E. Product test reports.

F. Preconstruction compatibility and adhesion test reports.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021.

B. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: To match color of new concrete and as selected by Architect from manufacturer's full range.

2.02 COLD-APPLIED JOINT SEALANTS

A. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant for Concrete: ASTM C 920, Type M, Grade P, Class 25, for Use T.

2.03 JOINT-SEALANT BACKER MATERIALS

A. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

2.04 PRIMERS

A. Primers: Product 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.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Cleaning of Joints: Clean out joints immediately before installing joint sealants.

C. Protection: Protect bluestone and other adjacent materials to prevent sealant spills, drips, strings, or other surface blemishes.

D. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

E. Install joint-sealant backings of kind indicated to support joint 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 joint-sealant backings.
   2. Do not stretch, twist, puncture, or tear joint-sealant backings.
   3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

F. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place joint 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.

G. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements 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 joint sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

H. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

I. Clean off excess joint 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.

END OF SECTION 32 1373

SECTION 32 1813 - SYNTHETIC GRASS SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES.

A. Synthetic Turf Surfacing: Product collections.
   1. SynPlay at batting cages.
   2. Astroturf at baseball bull pen.
   3. Batting mat.

1.02 RELATED SECTIONS.

A. Section 03 3000 - Cast-in-Place Concrete. For concrete substrate.

1.03 REFERENCES.

A. ASTM International (ASTM):
   1. ASTM D1335 - Test Method for Tuft Bind of Pile Yarn Floor Coverings.
   2. ASTM D1577 - Standard Test Methods for Linear Density of Textile Fibers.
   3. ASTM D2256 - Standard Test Method for Tensile Properties of Yards by the Single-Strand Method.
   4. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.
   5. ASTM D5034 - Standard Test Method for Breaking Strength and Elongation of Textile Fabrics.
   6. ASTM D5793 - Standard Test Method for Binding Sites per Unit Length or Width of Pile Yard Floor Coverings.
   7. ASTM D5823 - Standard Test Method for Tuft Height of Pile Floor Coverings.
   8. ASTM D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings.
   9. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.
   10. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
   11. ASTM F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces.
   12. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment.
   13. ASTM F1551 - Standard Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials.
   14. ASTM F1951 - Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

1.04 SUBMITTALS.

A. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

B. Verification Samples: Two representative units of each type, size, pattern, and color of synthetic turf surfacing indicated.

C. Shop Drawings: Installation details including roll and seaming layout, methods of attachment and details at penetrations and terminations.
   1. Show layout of marking plan if any, indicating details for specified activity

areas.

D. Qualification Data: For Installer.

E. Installation Schedule: Showing planned commencement and completion dates for each portion of the Work; include critical dates indicated on Owner's project schedule.

F. Warranty: Sample warranty specified in this Section.

G. Maintenance Materials:
1. Extra materials that match products installed and packaged with protective covering for storage and identified with labels describing contents.
1. Seaming Materials: Sufficient quantity for 100 sq. ft.
2. Synthetic Turf Fiber: Sufficient quantity for 100 sq. ft.
3. Infill Material: Sufficient quantity for 100 sq. ft., in weatherproof bags.

1.05 QUALITY ASSURANCE.

A. Manufacturer Qualifications: A firm experienced in manufacturing synthetic turf surfacing materials like those specified for this project, with a record of successful service for a minimum of 5 years.

B. Installer Qualifications: An experienced Installer certified by the manufacturer, employing workers trained and approved by the manufacturer.

C. Source Limitations: Obtain synthetic turf surfacing materials through one source from a single manufacturer.
1. Provide secondary materials including adhesives, paint, thread, and repair materials of type and from source recommended by manufacturer of synthetic turf surfacing materials.

D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
1. The intent of the mock-up is to demonstrate quality of workmanship and visual appearance.
2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
3. Retain mock-up during construction as a standard for comparison with completed work.
4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.06 PRE-INSTALLATION CONFERENCE.

A. Conduct conference at Project site following award of contract. Review methods and procedures related to synthetic turf surfacing installation including, but not limited to, construction schedule, availability of materials, equipment and facilities needed to make progress and avoid delays, installation procedures, inspection procedures, and coordination with other work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction

operations.

1.08 PROJECT CONDITIONS.

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.09 WARRANTY

A. Manufacturer's standard limited warranty unless indicated otherwise.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS.

A. Certification: Provide synthetic turf surfacing system with safety performance testing certified by IPEMA.

B. Environmental: Provide synthetic turf surfacing system with EN 71-3 Heavy Metal Analysis.

C. Specifier: Retain "Shock Attenuation Value" Paragraph below when required for Project. Coordinate with information on Drawings and Fall Pad requirements in Article 2.4 below.

D. Shock Attenuation Value: Provide synthetic turf system with G-max value not exceeding 200 and Head Injury Criteria (HIC) not exceeding 1,000 in accordance with ASTM F 1292, based upon application and fall height indicated on Drawings.

E. Specifier: Retain "Fire-Test-Response Characteristics" Paragraph below if fire-tested product is required by authorities having jurisdiction or desired by Owner.

F. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

G. Specifier: Retain "Exterior Fire-Test Exposure" Paragraph below if fire-tested product is required by authorities having jurisdiction or desired by Owner. ASTM E108 applies to SYNLawn Play Platinum product.

H. Exterior Fire-Test Exposure: Provide synthetic turf surfacing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction.

I. Specifier: Retain "Surface Burning Characteristics" Paragraph below if required by authorities having jurisdiction.

J. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings from an applicable testing agency.
   1. Flame-Spread Index: Class A.
   2. Smoke-Developed Index: 50 or less.

K. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility

Guidelines for Buildings and Facilities and ICC A117.1 for recreation surfaces.

1. Provide synthetic turf system meeting requirements of ASTM F1951.

2.02 SYNPLAY COLLECTION

A. Manufacturer: Synlawn; Phone 866.796.5296.

B. Basis of Design Product: SYNLawn SYNPLAY 60 with Pad.

1. Test Data: ASTM D2859, E648, F1292, F1951, IPEMA, PFA-Free.
2. Features: Deluster, UV Stabilizers.
3. Grass Zone Yarn: Polyethylene. Yarn Shape: Slit Film.
    1. Constructed: Tufted.
4. Grass Zone Denier: Green: 8040/1. Colors: 10000/1
5. Thatch Zone Yarn/Color:
    1. Green: Nylon / Turf Green.
    2. Navy: PE / Black.
    3. Colors: Matches Turf Color.
6. Thatch Zone Denier: 6,000 / 8.
7. Pile Height (Nominal)per ASTM D5823: 3/4 inches.
8. Face Weight per ASTM D5848: 58 oz/yd2.
9. Total Fabric Weight per ASTM D5848: 116 oz/yd2.
10. Backing: 15 / 18 PP 2-Part / 5 mm cushion.
11. Primary Backing Weight per ASTM D5848: 60 oz/yd2.
12. Cushion Weight: 52 oz per sq yd.
13. Tuft Bind per ASTM D1335: Greater than 8 lbs.
14. Grab Tear Strength (Average) per ASTM D5034: Greater than 200 lbs.
15. Total Yarn Linear Density per ASTM D1577: 14,040/16,000 Denier.
16. Elongation to Break per ASTM D2256: Greater than 30 percent.
17. Yarn Breaking Strength per ASTM D5793: Greater than 20 lbs.
18. Tuft Machine Gauge per ASTM D5793: 3/16 inches.
19. Flammability per ASTM D2859: Passed.
20. Water Permeability per ASTM D1551: N/A.
21. Fabric Width 15 ft.

2.03 ASTROTURF

A. Manufacturer: Astroturf; Phone 800.723.8873, 248.941.2453.

B. Basis of Design Product: Rootzone 3D3 Blend, 2” , .52 oz.

1. Pile Yarn: Yarn shall be proven athletic quality yarn designed specifically for outdoor use and stabilized to resist the effects of ultraviolet degradation, heat, foot traffic, water and airborne pollutants. The primary pile fiber shall possess the following characteristics:

Materials Properties	Minimum Specifications
Primary Yarn Polymer	Trionic Co-Polymer Monofilament, Polyethylene Slit Film
Fiber Type	
Standard Color	Standa
Line and Marking Colors	Refer t
UV Stabilized	Yes
Fabric Construction	Tufted
Primary Backing	Multila
Secondary Backing Type	Full Co

Yarn Denier
Infill Ratio
Fiber Reveal
Note: Exceptions to specifications shall be outlined within proposal.

2. Physical Properties/Values

Properties		
Pile Height (Nominal)		2"
Fiber Denier		
Thickness		
Tuft Gauge		
Total Product Weight		78 oz/s
Pile Yarn Fiber Weight	52 oz/sy	
Primary Backing Weight	7 oz/sy	
Secondary Backing Weight	20 oz/sy	
Ave. Grab Tear Strength	>200 lb/force	
Ave. Tuft Bind Strength	>10 lb/force	
Break Strength		
Elongation		
Total Lead Content		<50 pp
Infiltrometer		
Pill Flammability	Pass	D2859-06 (2011)
G-Max (Per Warranty)	<120 @ Install	F355-10a

Note: Exceptions to specifications shall be outlined within proposal.

2.04 BATTING MAT

A. Manufacturer: Beacon Athletics; Phone 800.747.5985.

B. Basis of Design Product: 12’ x 6’ Pro Batting Mat with Inlaid Home Plate.
1. Color: Green.
2.

2.05 SUPPLEMENTARY TURF SURFACING MATERIALS.

A. Perimeter Nailer Board: Manufacturer's approved nailer/edger board.

B. Curbing: Profile and extent as indicated on Drawings.

2.06 MATERIALS.

A. Infill Material: Synthetic antimicrobial treated silica sand infill in manufacturer's recommended formula for application to synthetic turf surfacing.

B. Glue, Seaming Fabric, and Thread: As recommended by manufacturer for application.

C. Finishing Stone: Decomposed granite fines.

D. Open Graded Aggregate: Sound crushed graded stone or gravel complying with ASTM D 448 for Size No. 8.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine synthetic turf surfacing base and perimeter conditions, with Installer

present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.
1. Verify substrate meets profile required.
2. Confirm base material, compaction of substrate, permeability, and drainage system installation meets requirements.

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

3.02 SUBBASE PREPARATION

A. General: Prepare substrates to receive surfacing products according to synthetic turf surfacing manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions. Remove organic debris. Grade soil subgrade level and compact.
1. Finish grade soil subgrade with slope between 0.5 percent and 1.0 percent toward path of site drainage.
    1. Compact subgrade in both directions with mechanical compacting equipment to achieve specified compaction at 90 percent standard Proctor.
    2. Prepare subgrade to tolerance of within 0.5 inch of design grade.
    3. Prepare subgrade within 0.25 inch in 10 feet in any direction from design grade over entire playing surface.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

B. Aggregate Course:
1. Place aggregate base course, compact by tamping with plate vibrator to 90 percent of ASTM D 1557 maximum laboratory density, and screed to depth indicated. Install 4-inch base course unless otherwise indicated.
    1. Slope base course between 0.5 percent and 1.0 percent, measured from the longitudinal center of the installation towards the edges. Grade base course to tolerance of within 0.5 inch of design grade, and with a maximum variation of 0.25 inch in 10 feet in any direction.

C. Perimeter Nailer Board: Install as indicated on approved shop drawings, using soil nails of size, and spacing indicated.

D. Synthetic Turf:
1. General: Comply with synthetic turf surfacing manufacturer's written installation instructions. Install synthetic turf surfacing over area and in thickness indicated.
2. Fall Pad: Place fall pads tightly abutted over area to receive synthetic turf surfacing. Tape seams with pad seam tape to secure pads in position prior to installing synthetic turf.
3. Artificial Turf: Loose-lay artificial turf and allow fabric to relax for period recommended by manufacturer. Stretch carpet and attach at perimeter in accordance with approved submittals.
4. Seaming: Form seams flat and snug, with no gaps or fraying. Remove yarns that are trapped within seams. Form seams as recommended in synthetic turf manufacturer's written instructions using manufacturer's provided or recommended materials.
5. Attachment: Attach turf fabric to perimeter restraint system as recommended by the manufacturer.

E. Activity Lines and Markers: Install lines in accordance with approved submittals.

F. Infill: Mix and install infill material components in accordance with manufacturer's requirements for approved system. Groom material and leave surface ready for use.

3.04 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.05 PROTECTION

A. Protect completed installation from damage. Prevent traffic over system prior to acceptance by Owner.

3.06 DEMONSTRATION

A. Instruct Owner's personnel in proper inspection and maintenance of synthetic turf surfacing. Review manufacturer's recommended maintenance procedures and warranty terms and conditions.

3.07 CLEANING

A. Clean products in accordance with the manufacturers recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 32 3113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Relocation of existing chain-link fences.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
      a. Fence and gate posts, rails, and fittings.
      b. Chain-link fabric, reinforcements, and attachments.

1.04 FIELD CONDITIONS

A. Field Measurements: Verify layout information for gate relocations shown on Drawings in relation to existing and proposed site improvements. Verify dimensions by field measurements and confirm with Owner and Architect.

1.05 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure to comply with performance requirements.
      b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      c. Faulty operation of relocated gates.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.

B. Post Size: Determine according to ASTM F1043 for existing post spacing and gate sizes, for Material Group IA, ASTM F1043, Schedule 40 steel pipe.
      a. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified.

2.02 CHAIN-LINK FENCE FABRIC

A. General: Salvage and reuse existing fence fabric. If new fabric is required due to damage, provide to match existing.
   1. Fabric Height:
      a. Perimeter Fence, Softball Home Bull Pen: 72 inches.
      b. Gate: 48 inches.
   2. Steel Wire for Fabric: 9gauge.
      a. Mesh Size: 2 inches.
      a. Polymer-Coated Fabric: ASTM F668, Class 2b over zinc-coated steel wire.
         1) Color: Black.
      b. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.
   3. Selvage: Knuckled at both selvages.

2.03 FENCE FRAMEWORK

A. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 or ASTM F1083 based on the following:
   1. Fence Height:
      a. Perimeter Fence, Softball Home Bull Pen: 72 inches.
      b. Gate: 48 inches.
   2. Perimeter Fence Post Material: Light-Industrial-Strength Group IC-L, round steel pipe, electric-resistance-welded pipe.
      a. Line Post: 2 ½" (2.375) O.D.
      b. Corner Post: 3" (2.875) O.D.
   3. Horizontal Framework Members: Rails according to ASTM F1043.
      a. Top and Bottom Rail: 1 5/8" (1.625) O.D.
      b. Gate Frame: 2" (1.875) O.D.
   4. Polymer-Coated: ASTM F934, over zinc-coated frame.
      a. Color: Black.

2.04 TENSION WIRE

A. Polymer-Coated Steel Wire: 0.177-inch-diameter, tension wire according to ASTM F1664, Class 2b over zinc-coated steel wire.
   1. Color: Match chain-link fabric (Black), according to ASTM F934.

2.05 SWING GATES

A. General: ASTM F900 for gate posts and single swing gate types.
   1. Gate Leaf Width: As indicated.
   2. Framework Member Sizes and Strength: Based on gate fabric height as indicated.

B. Pipe and Tubing:
   1. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework.
   2. Gate Posts: Round tubular steel.
   3. Gate Frames and Bracing: Round tubular steel.

C. Frame Corner Construction: Welded.

D. Hardware:
   1. Hinges: 360-degree inward and outward swing.

2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Padlock and Chain: Provided by Owner.

2.06 FITTINGS

A. General: Match existing fence fittings where they cannot be salvaged and reused. This includes post caps, braces, rail fittings, tie wires, clips, etc.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

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

3.02 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.03 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated by Contractor's structural engineer, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
a. Concealed Concrete: Place top of concrete 2 inches below grade to allow covering with surface material.

D. Tension Wire: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
1. Extended along bottom of fence fabric. Install bottom tension wire within 4 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

E. Top Rail: Install according to ASTM F567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

F. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

G. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.
   1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

3.04 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

3.05 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION 32 3113

SECTION 32 3119 - DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
1. Decorative steel fences.
2. Decorative steel swing gates.

B. Related Requirements:
1. Section 03 3053 "Cast-in-Place Concrete" for concrete and post concrete fill.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fencing and gates.
1. Include plans, elevations, sections, gate locations, post spacing, and mounting attachment details.
2. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
3. Wiring Diagrams: Include diagrams for power, signal, and control wiring.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For gate operators to include in maintenance manuals.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Wind Loading:
1. Fence Height: 0 to 15 feet.
2. Wind Exposure Category: B.
3. Design Wind Speed: 110.

2.02 DECORATIVE METAL SECURITY FENCES

A. Basis of Design Product: Subject to compliance with requirements, provide the product indicated on Drawings and as described below, or approved equal:
1. Manufacturer: Ameristar Perimeter Security, Tulsa, OK.
2. Fence Model: Aegis II.
3. Fence Style: Genesis 3-rail.
4. Height: 6-foot.
5. Fence Post Size: 3” square x 12 gauge.
6. Fence Rail: 1 ¾” Forerunner.
7. Fence Picket: 1” square x 14 gauge.

8. Swing Gate Post Size: 3” square; post material per gate manufacturer specifications
9. Swing Gate Rail: 1 ¾” Forerunner.
10. Swing Gate Site Frame: 2” square x 12 gauge.
11. Post Mount: In-ground concrete foundation per manufacturer specifications
12. Post Caps: Manufactuer’s standard flat cap.
13. Miscellaneous Hardware: Manufacturer’s standard hardware.
14. Coating: Manufacturer’s standard powder coat.
15. Color: Black

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.

B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

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

3.02 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.03 DECORATIVE FENCE INSTALLATION

A. Install fences according to manufacturer's written instructions.

B. Install fences by setting posts as indicated and fastening rails and infill panels to posts. Peen threads of bolts after assembly to prevent removal.

C. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches plus 3 inches for each foot or fraction of a foot that fence height exceeds 4 feet.

D. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
    a. Exposed Concrete: Extend 2 inches above grade. Finish and slope top surface to drain water away from post.
    b. Concealed Concrete: Top below grade as indicated on Drawings to allow covering with surface material. Slope top surface of concrete to drain water away from post.
3. Posts Set in Concrete: Extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete.
4. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least 3/4 inch larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts.
    a. Extend posts at least 5 inches into sleeve.

b. After posts have been inserted in sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.

5. Posts Set into Voids in Concrete: Form or core drill holes not less than 3/4 inch larger than outside diagonal dimension of post.
   a. Extend posts at least 5 inches into concrete.
   b. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.
6. Space posts uniformly at 8 feet o.c.

3.04 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
   1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.
   2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
   3. Report: Prepare test reports of grounding resistance at each test location certified by a testing agency. Include observations of weather and other phenomena that may affect test results.

3.06 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION 32 3119

SECTION 32 3300 - SITE FURNISHINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
1. Sports netting.
2. Bleacher stands.
3. Archway.

B. Related Requirements:
1. Section 03 3000 "Cast-in-Place Concrete" for concrete footings.
2. Section 31 2000 "Earth Moving" for excavation for installing concrete footings.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Engineered shop drawings for each type of applicable product, signed and sealed by a Professional Engineer licensed in the State of Michigan.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 2 - PRODUCTS

2.01 SPORTS NETTING

A. Sports netting shall be provided as a complete system. Netting systems shall be fully detailed during the Contractor design-assist period including netting, removable netting attachments, structural framework, foundations and all necessary accessories.

B. Basis of Design Requirements:
1. As manufactured and installed by: NET CONNECTION; Trussville, AL or approved equal.
2. Netting systems shall be designed for project site exposures for wind, snow, and ice loading per ASCE 7.
3. Netting system heights shall be per chart below.
4. Galvanized steel poles painted black. Approximate spacing as indicated on chart below. Permanent embedment in concrete footings.
5. Stainless steel top, bottom, and side tension cables between posts for netting support and tensioning.
6. Netting with 5/16” polyester rope border and removable clips to tension cables.

	Post Size	Post Qty.	Post Spacing	Netting Size
Baseball Backstop	**40’ ht. x 16” dia.**	**5**	**See Plan**	**#36 x 1 ¾” sq. Nylon**
Softball Backstop	**35’ ht. x 12” dia.**	**4**	**See Plan**	**#36 x 1 ¾” sq. Nylon**
Baseball Batting Cages	**12’ ht. x 10” dia.**	**6**	**See Plan**	**#36 x 1 ¾” sq. Nylon**
Softball Batting Cages	**12’ ht. x 10” dia.**	**4**	**See Plan**	**#36 x 1 ¾” sq. Nylon**
Soccer Netting (North)	**40’ ht. x 12” dia.**	**6**	**+/- 53’**	**#36 x 1 ¾” sq. Nylon**
Soccer Netting (South)	**20’ ht. x 10” dia.**	**6**	**+/- 53’**	**#36 x 4” sq. Nylon**

2.02 BLEACHER STANDS

A. Bleachers shall be provided as a complete system. Bleacher system shall be fully detailed during the Contractor design-assist period including structural framework, foundations and all necessary accessories.

B. Basis of Design Requirements:
1. As manufactured and installed by: SOUTHERN BLEACHER COMPANY; Graham TX or approved equal.
2. Bleacher system shall be designed for structural loads per ICC 300 and AISC.
3. All steel galvanized. Handrails and risers with anodized aluminum finish All remaining aluminum with mill finish. Guardrail with 6 gauge vinyl coated chainlink fence. Permanent surface mount to concrete slab. Install per manufacturer’s recommendation.

2.03 ARCHWAY

A. Archway shall be provided as a complete system. Archway system shall be fully detailed during the Contractor design-assist period including logo, lettering, structural framework, foundations and all necessary accessories.

B. Basis of Design Requirements:
1. As manufactured and installed by: WE BUILD FUN (ICON) or approved equal. Contact: Keith Alexander; Phone: 734.560.5537.
2. Archway system shall be designed for project site exposures for wind, snow, and ice loading per ASCE 7.
3. Galvanized steel members with painted finish. Color per owner. Spacing as indicated on drawings. Permanent embedment in concrete footings.

2.04 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.05 STEEL AND GALVANIZED STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

3.03 CLEANING

A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 32 3300

SECTION 32 9113 - SOIL PREPARATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes planting soils for disturbed lawn areas.

B. Related Sections:
1. Division 32 Section 32 9200 ‘Turf and Grasses’ for topsoil/ seed bed preparation and seeding.

1.03 DEFINITIONS

A. Retain terms that remain after this Section has been edited for a project.

B. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

C. Imported Soil: Soil that is transported to Project site for use.

D. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

E. Topsoil: Imported soil; or manufactured soil that has been modified as specified with required soil amendments to produce a soil mixture best for turf growth.

F. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

G. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

H. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Submit a certified analysis of topsoil from all sources from an independent testing laboratory prior to placement. Topsoil shall meet criteria set fourth within the paragraph 2.1 deficiencies shall be corrected prior to placement of topsoil.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Planting-Soil for Lawns: Topsoil shall be imported, shred before spreading.
   1. Imported topsoil shall meet the following criteria, be confirmed through test results and submitted to the Project Engineer. Imported topsoil shall be weed-free and free of extraneous material (stones, sticks, etc.) larger than ½".
      a. pH range between 5.5 and 6.5
      b. Soluble salts content 500 ppm (parts per million) maximum
      c. Organic content between 5 and 30 percent
      d. Clay content between 5 and 25 percent

2.02 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   1. Class: T, with a minimum of 99 percent passing through a sieve and a minimum of 75 percent passing through a sieve
   2. Class: O, with a minimum of 95 percent passing through a sieve and a minimum of 55 percent passing through a sieve.
   3. Form: Provide lime in form of ground dolomitic limestone.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a sieve and a maximum of 10 percent passing through a sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Sand: Clean, washed, natural or manufactured, free of toxic materials and according to ASTM C 33/C 33M.

PART 3 - EXECUTION

3.01 GENERAL

A. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in subsoil or topsoil.

3.02 PLACING TOPSOIL OVER DISTURBED LAWN AREAS

A. Remove 4" of existing topsoil within disturbed lawn areas.

B. Subgrade Preparation: Till subgrade to a minimum depth of Remove stones larger than in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Remove stones larger than in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

D. Spreading topsoil for Lawns: Spread topsoil to a minimum total depth of 4" but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

E. Compaction: Compact each lift of planting soil to 85 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place.

F. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.03 PROTECTION AND CLEANING

A. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform seeding operations:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Vehicle traffic.
   4. Foot traffic.
   5. Erection of sheds or structures.
   6. Impoundment of water.
   7. Excavation or other digging unless otherwise indicated.

B. Remove surplus soils and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
   1. Dispose of excess existing subsoil, topsoil and unsuitable materials off site.

END OF SECTION 32 9113

SECTION 32 9200 - TURF AND GRASSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Seed bed preparation, fertilization, seeding, sodding, mulching, maintenance and turf warranty.

B. Related Sections:
   1. Division 32 Section 32 9113 “Soil Preparation” for topsoil preparation and placement.

1.03 DEFINITIONS

A. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

B. Weeds: includes dandelion, jimsonweed, quackgrass, horsetail, morning glory, rush grass, mustard, lambsquarter, chickweek, cress, crabgrass, Canadian thistle, nutgrass, poison oak, blackberry, tansy ragwort, Bermuda grass, Johnson grass, poison ivy, nut sedge, nible will, bindweed, bent grass, wild garlic, perennial sorrel and brome grass.

C. Topsoil: Use imported topsoil. See Section 32 9113 “Soil Preparation” and drawing designations for topsoil and seeding.

1.04 REFERENCES

A. Michigan Department of Transportation (MDOT) – 2012 Standard Specification for Construction.

1.05 PREINSTALLATION MEETINGS

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

1.06 INFORMATIONAL SUBMITTALS

A. Certification of grass seed and sod.
   1. Certification of each seed mixture.

B. Product certificates and data.

C. Submit sample of mulch blanket.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

2. Pesticide Applicator: State licensed, commercial.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

PART 2 - PRODUCTS

2.01 SEED AND SOD

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed and Sod Species:
1. Quality: Seed of grass species as listed below with not more than 0.5 percent weed seed:
2. Supplier: Rhino Seed, 800.482.3130.
a. Seed Blend: ‘School Lawn Mix’.
1) Seeding Rate: 250 lbs./acre.

2.02 FERTILIZERS

A. Recommended starter fertilizer for grass with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil as indicated within topsoil analysis, and shall contain a minimum of 4% phosphorus acid, 2% soluble potash and sufficient nitrogen to provide one pound of actual nitrogen per 1000 square feet of lawn area.

2.03 MULCH BLANKET

A. Mulch Blanket: Shall be DS150 Double Net Straw Blanket as manufactured by North American Green, 248.596.4300, 866.960.4300.

2.04 PESTICIDES AND HERBICIDES

A. General: Pesticides and herbicides may only be used with written permission from Owner.

PART 3 - EXECUTION

3.01 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 32 9113 "Soil Preparation."

B. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

C. Before seeding, obtain Architect’s acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.02 PLANTING SEASON

A. April 1st through May 31st or August 16th through October 10th unless otherwise noted on plans or directed by Engineer.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

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 fertilizer thoroughly into upper two inches (2") of topsoil

3.04 MECHANICAL SEEDING

A. Sow seed with mechanical seeder.
   1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   2. Do not use wet seed or seed that is moldy or otherwise damaged.
   3. Do not seed immediately following rain, when ground is dry, or during windy periods.

B. Sow seed at a total rate of 250 lbs. per acre.

C. Rake seed lightly into top 1/8 inchof soil, roll lightly, and water with fine spray.

D. Within 24 hours of seeding, all areas shall be mulched using mulch blanket. Mulch blanket shall be spread evenly with extreme care so as to leave the seeded lawn surface with a minimal amount of damage. Stake mulch blanket per manufacturers instructions.

3.05 SODDING

A. Athletic Fields: If turf seeding can not be fully established prior to the specified substantial completion date, the contractor shall sod disturbed areas within the athletic play fields at no additional cost to Owner. Sod composition shall match the specified Athletic Field Repair seed mix.

3.06 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Establishment period will require multiple mowings.

3.07 SATISFACTORY TURF

A. Prior to acceptance, turf installations shall meet the following criteria as determined by Landscape Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory. Maintenance shall include mowing of seeded lawn areas and watering.

END OF SECTION 32 9200

SECTION 33 4200 - STORMWATER CONVEYANCE

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:
1. PE pipe and fittings.
2. PVC pipe and fittings.
3. Concrete pipe and fittings.
4. Non-pressure transition couplings.
5. Expansion joints.
6. Cleanouts.
7. Encasement for piping.
8. Manholes.
9. Polymer-concrete, channel drainage systems.
10. Catch basins.
11. Stormwater inlets.
12. Trench drain.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.
3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

C. Product Certificates: For each type of cast-iron soil pipe and fitting.

D. Field quality-control reports.

1.03 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.01 CORRUGATED-PE PIPE AND FITTINGS

A. Corrugated-PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252, Type S, with smooth waterway for coupling joints.

B. Corrugated-PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294, Type S, with smooth waterway for coupling joints.

C. Corrugated-PE Silttight Couplings: PE sleeve with ASTM D1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

D. Corrugated-PE Soiltight Couplings: AASHTO M 294, corrugated, matching pipe and fittings.

2.02 PVC PIPE AND FITTINGS

A. NSF Marking: Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

B. PVC Corrugated Sewer Piping:
   1. Pipe: ASTM F949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: ASTM F949, PVC molded or fabricated, socket type.
   3. Gaskets: ASTM F477, elastomeric seals.

2.03 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76.
   1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C443, rubber gaskets.
   2. Class IV.

2.04 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Concrete Pipes: ASTM C443, rubber.
   2. For Cast-Iron Soil Pipes: ASTM C564, rubber.
   3. For Fiberglass Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
   4. For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
   5. For Dissimilar Pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:
   1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:
   1. Description: ASTM C1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:
   1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.05 CLEANOUTS

A. PVC Cleanouts:
   1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.06 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps; FRP ladder; or ASTM A615/A615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

2.07 CONCRETE

A. General: Cast-in-place concrete in accordance with ACI 318, ACI 350, and the following:
   1. Cement: ASTM C150/C150M, Type II.
   2. Fine Aggregate: ASTM C33/C33M, sand.
   3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
   1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
      a. Invert Slope: 1 percent through manhole.
   2. Benches: Concrete, sloped to drain into channel.
      a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

2.08 CATCH BASINS

A. Standard Precast Concrete Catch Basins:
   1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
   4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
   5. Joint Sealant: ASTM C990, bitumen or butyl rubber.
   6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
   7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and grate.
   8. Steps: Individual FRP steps; FRP ladder; or ASTM A615/A615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60inches.
   9. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include flat grate with small square or short-slotted drainage openings.
   1. Size: 24 by 24 inches minimum unless otherwise indicated.
   2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

C. Frames and Grates:
   1. Pavement edge or gutter line: EJ Group 5080 or as indicated on the plans.
   2. Paved areas other than edge gutter line: EJ Group 1040 Type M or as indicated on the plans.
   3. Yard areas: EJ Group 1040 Type N or as indicated on the plans.

2.09 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions in accordance with utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions in accordance with utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions in accordance with utility standards. Include heavy-duty frames and grates.

D. Frames and Grates
   1. Pavement edge or gutter line: EJ Group 5080 or as indicated on the plans.
   2. Paved areas other than edge gutter line: EJ Group 1040 Type M or as indicated on the plans.
   3. Yard areas: EJ Group 1040 Type N or as indicated on the plans.

2.10 TRENCH DRAIN

A. Drain Body: Heavy-duty reinforced polymer sloped channel system with 8” internal channel width. Provide one of the following systems:

1. Zurn Z886-Series
2. ACO Powerdrain
3. Polydrain PDX

B. Cover Material: Ductile iron, 15 square inches per foot minimum open area, ADA compliant and feel proof.

1. DIN Rating: Class E
2. ANSI Rating: H-20 Loading or greater

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 31 2000 "Earth Moving."

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping in accordance with the following:
1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 36-inch-minimum cover.
4. Install hub-and-spigot, cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
5. Install hubless cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
6. Install ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
7. Install PE corrugated sewer piping in accordance with ASTM D2321.

8. Install PVC sewer piping in accordance with ASTM D2321 and ASTM F1668.
9. Install nonreinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."
10. Install reinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."

G. Install corrosion-protection piping encasement over the following underground metal piping in accordance with ASTM A674 or AWWA C105/A21.5:
1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless cast-iron soil pipe and fittings.
3. Ductile-iron pipe and fittings.
4. Expansion joints.

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping in accordance with the following:
1. Join hub-and-spigot, cast-iron soil piping with gasketed joints in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
2. Join hub-and-spigot, cast-iron soil piping with caulked joints in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum caulked joints.
3. Join hubless cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
4. Join ductile-iron culvert piping in accordance with AWWA C600 for push-on joints.
5. Join ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
6. Join corrugated-PE piping in accordance with ASTM D3212 for push-on joints.
7. Join PVC corrugated sewer piping in accordance with ASTM D2321 for elastomeric-seal joints.
8. Join nonreinforced-concrete sewer piping in accordance with ASTM C14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
9. Join reinforced-concrete sewer piping in accordance with ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
10. Join dissimilar pipe materials with nonpressure-type flexible couplings.

B. Join force-main pressure piping in accordance with the following:
1. Join PVC pressure piping in accordance with AWWA M23 for gasketed joints.
2. Join dissimilar pipe materials with pressure-type couplings.

3.04 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch(es above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.05 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 1 inch above finished surface elsewhere unless otherwise indicated.

3.06 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.07 STORMWATER INLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.08 CONCRETE PLACEMENT

A. Place cast-in-place concrete in accordance with ACI 318.

3.09 CHANNEL DRAINAGE SYSTEM INSTALLATION

A. Install with top surfaces of components, except piping, flush with finished surface.

B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

C. Embed channel sections and drainage specialties in 4-inch-minimum concrete around bottom and sides.

D. Fasten grates to channel sections if indicated.

E. Assemble channel sections with flanged or interlocking joints.

F. Embed channel sections in 4-inch-minimum concrete around bottom and sides.

3.10 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 22 1413 "Facility Storm Drainage Piping."

B. Connect force-main piping to building's storm drainage force mains specified in Section 22 1413 "Facility Storm Drainage Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.
   1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
      a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
      b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
   4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Connect to sediment interceptors specified in Section 22 1323 "Sanitary Waste Interceptors."

E. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
   1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
      a. Unshielded or Shielded flexible couplings for same or minor difference OD pipes.
      b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
      c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.11 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
   1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
   2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
   1. Remove manhole or structure and close open ends of remaining piping.
   2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade in accordance with Section 31 2000 "Earth Moving."

3.12 IDENTIFICATION

A. Materials and their installation are specified in Section 31 2000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
   1. Use warning tape or detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.13 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems in accordance with requirements of authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate report for each test.
   5. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction, UNI-B-6, and the following:
      a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
      b. Option: Test plastic piping in accordance with ASTM F1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.14 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 33 4200

APPENDIXES

APPENDIX 1

Geotechnical Investigation

Dated December 29, 2025



REPORT ON GEOTECHNICAL INVESTIGATION

2025 DEXTER SCHOOLS BOND PROGRAM

DHS FIELDHOUSE AND SITE IMPROVEMENTS AND AL RITT STADIUM LIGHTING

DEXTER, MICHIGAN 48130

LATITUDE 42.324878° N
LONGITUDE 83.89651° W

G2 CONSULTING GROUP

Prepared for:

Granger Construction
6267 Aurelius Road
Lansing, Michigan 48911

G2 Project No. 253566S
December 29, 2025

CONSULTING GROUP
Smart.Results.Fast.

December 29, 2025

Mr. Greg Brand, P.E.
Senior Project Manager
Granger Construction
6267 Aurelius Road
Lansing, Michigan 48911

RE: Report on Geotechnical Investigation
2025 Dexter Schools Bond Program
DHS Fieldhouse and Site Improvements and Al Ritt Stadium Lighting
Dexter, Michigan 48130
G2 Project No. 253566

Dear Mr. Brand:

We have completed the geotechnical investigation associated with the 2025 Dexter Schools Bond Program, which includes construction of the proposed fieldhouse athletic building and site improvements at Dexter High School, as well as the construction of stadium lighting at Al Ritt field. This report presents the results of our observations and analyses, as well as recommendations related to earthwork, subgrade preparation, foundation design, bituminous pavement design, in-situ infiltration, and related construction considerations.

We appreciate the opportunity to be of service to Granger Construction and look forward to discussing the recommendations presented. In the meantime, if you have any questions regarding the report or any other matter pertaining to the project, please call us.

Sincerely,

G2 Consulting Group, LLC

Ryan P. Carpus, P.E.
Project Engineer

Jennifer M. Casey, P.E.
Project Consultant

Tyler S. Hesse, P.E.
Project Manager

RPC/TSH/JMC/tsh

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EXECUTIVE SUMMARY

We understand the proposed project consists of constructing a new fieldhouse, pavements, a detention pond, and two (2) underground stormwater management structures at Dexter High School and new lighting at Al Ritt Stadium.

Approximately 2 to 10 inches of topsoil or 12 to 24 inches of crushed limestone aggregate are generally present at the ground surface of the soil borings. Within soil borings B-21 and B-22, B-28, B-31, B-33, B-37, and B-38, stiff to very stiff cohesive fill soils and very loose to medium compact granular fill soils underlie the topsoil and extend to approximate depths ranging from 3 to 6 feet. In general, the native soils consist of alternating strata of very loose to compact granular and stiff to very hard cohesive soils, extending to the explored depths ranging from 10 to 35 feet below grade. Groundwater was encountered at approximate depths ranging from 5 to 20 feet below existing grade within borings B-21 through B-29, B-31, and B-36 through B-39. Upon completion of drilling operations, the groundwater level within these borings was measured at depths ranging from 6 to 29 feet below grade. No measurable groundwater was observed during or upon completion of drilling operations within borings B-30 or B-32 through B-35. The rise in the groundwater level above the encountered elevation within soil borings B-22, B-23, and B-31 may be indicative of an artesian condition.

The fill soils noted above do not appear to have been placed in an engineered manner and have organic matter contents ranging from 4.3 to 7.0 percent. Considering the existing ground surface elevations and the fieldhouse FFE, we anticipate the fill soils within the influence of the fieldhouse will be removed while adjusting site grades to achieve the design subgrade elevation. In addition, based on proposed pavement finished grades, we anticipate the existing fill soils will be removed during grading operations in the vicinity of soil borings B-28 and B-31. Some existing fill soil may remain beneath the proposed pavement section within the vicinity of soil boring B-33. The fill within soil boring B-33 does not contain any notable organic matter and is generally considered suitable for support of the pavement, following the successful completion of a proof-roll/proof-compaction evaluation.

We recommend the fieldhouse be supported by shallow conventional strip and/or spread footings designed to bear at a minimum depth of 3-1/2 feet below finished grades within the native loose to medium compact granular soils, very stiff to hard cohesive soils, or engineered fill. Foundations bearing within the above mentioned soils can be designed based on a net allowable bearing capacity of 2,500 psf. Recommended soil design parameters for drilled pier foundations for the light poles are provided in the FOUNDATION RECOMMENDATIONS section of this report. If the recommendations outlined in this report are adhered to, total and differential settlements for the completed structures should be within 1 inch and ½ inch, respectively. We expect settlements of these magnitudes are within tolerable limits for the type of structures proposed.

No significant groundwater accumulations are anticipated in construction excavations for the proposed fieldhouse, utilities, or stormwater BMPs. We anticipate any groundwater seepage or surface runoff can be controlled with a properly constructed system of sumps and pumps.

Caving and/or sloughing of the granular soils will occur during drilled shaft excavation operations. In addition, groundwater was encountered at depths ranging from 5 to 7 feet below existing grade. Therefore, the drilled pier contractor should come to the site prepared to use temporary steel casing to maintain a stable excavation and seal off groundwater. The contractor should also come to the site prepared to break-up and remove any cobbles encountered in the excavation and may need a rock auger to excavate through the very hard cohesive soils.

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

PROJECT DESCRIPTION

We understand the proposed project includes construction of a new fieldhouse with associated site improvements at Dexter High School (DHS) and new stadium lighting at the Al Ritt Stadium near Creekside Intermediate School. The site improvements at DHS will include the construction of bituminous concrete pavements, site concrete, utilities, and structural best management practices (BMPs) consisting of a detention pond and two (2) underground stormwater management structures.

We understand the fieldhouse will be constructed to the south of the existing twin turf fields located within the southwest quadrant of the DHS campus. The fieldhouse will be a single-story, slab-on-grade structure with a height of 61 feet, an approximate footprint of 63,072 square feet, and a finished floor elevation (FFE) of 887-1/2 feet. The northern portion of the structure will include an interior mezzanine. Information regarding structural loading conditions associated with the fieldhouse was unavailable at the time of this report. It is assumed that the structure will have column loads ranging from 75 to 150 kips and wall loads ranging from 3 to 5 kips per foot.

Based on the topographic survey provided, existing site grades within the vicinity of the fieldhouse range from elevation 882 to 894 feet. As the fieldhouse will have a FFE of 887-1/2 feet, we anticipate existing grades will be lowered by as much as 6-1/2 feet and raised by as much as 5-1/2 feet to achieve the design subgrade elevation.

We understand that a bituminous concrete service drive and parking areas will be constructed around the perimeter of the fieldhouse. Information regarding anticipated traffic frequencies throughout the pavement areas was unavailable at the time of this report; however, we understand a heavy-duty pavement is proposed. Based on the provided Dexter High School Field House Schematic Design Grading Plan dated October 2025, Sheet C402, pavement grades west of the fieldhouse will be approximately 6 to 8 feet lower than existing grades, pavement grades east of the fieldhouse will be approximately 12 feet higher or 7 feet lower than existing grades, and pavement grades along the service drive leading to the parking areas will be similar to existing grade at the east and west ends of the drive and will be as much as 7 feet lower than existing grades along the remainder of the alignment.

Based on the drawings provided, we understand that four (4) new stadium light poles will be constructed along the perimeter of the Al Ritt Stadium football field. The light poles will have heights of 80 to 90 feet above grade. The loading conditions for the stadium lighting poles were not available to us at the time of this report; however, we assume the poles will be supported using drilled shaft foundations. Based on the "Electrical New Work Site Plan" drawing by Peter Basso Associates, dated October 31, 2025, we understand electrical conduit will be installed via directional drilling methods beneath the athletic field at a minimum depth of 10 feet below current grades.

G2 Consulting Group, LLC (G2) was provided a Geotechnical Report prepared by Driesenga & Associates, Inc. (D&A) Project No. 2520656.3A, dated August 12, 2025. The D&A report was completed during the preliminary design stage for the project. D&A soil borings SB-1, SB-2, and SB-3 lie within the vicinity of the proposed fieldhouse. These boring logs are included in the Appendix of this report are have been used in development of the recommendations contained herein.

If information related to existing/final site grades, structural loading conditions, finished floor elevation, and/or anticipated traffic frequencies change or become available, G2 should be notified to re-evaluate the recommendations provided herein, if necessary. The purpose of our exploration is to determine and evaluate the general subsurface conditions at the above-mentioned locations and to develop recommendations for earthwork, subgrade preparation, foundation design, bituminous pavement design, and in-situ infiltration, as well as construction considerations as they relate to the geotechnical conditions on site.

SCOPE OF SERVICES

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

1. We performed a total of nineteen (19) soil borings throughout the above mentioned areas. Soil borings B-21 through B-26 per performed within the influence of the proposed fieldhouse extending to a depth of 25 feet each. Soil borings B-27 through B-35 were performed within the vicinity of the proposed pavement areas, detention pond, and underground stormwater management system, extending to depths ranging from 10 to 20 feet. Soil borings B-36 through B-39 were performed within the vicinity of the stadium light poles extending to depths ranging from 30 to 35 feet.

2. We performed laboratory testing on representative samples obtained from the soil borings. Laboratory testing included visual engineering classification, natural moisture content, organic matter content, Atterberg limits, and unconfined compressive strength determinations.

3. We prepared this engineering report. The report includes recommendations regarding earthwork, subgrade preparation, foundation design, bituminous pavement design, in-situ infiltration, and related construction considerations.

FIELD OPERATIONS

G2, in conjunction with Granger Construction, selected the number, depths, and locations of the soil borings. The boring locations were determined in the field by a G2 representative using GPS assisted mobile technology and by measuring from known surface features using conventional taping methods. The approximate soil boring locations are shown on the Soil Boring Location Plans, Plate Nos. 1 and 2. A topographic survey detailing existing surface grades at the soil boring locations associated with the DHS fieldhouse and parking lot, titled "Topographic Survey" by Arbor Land Consultants and dated October 30, 2025, was used to interpolate ground surface elevations at the boring locations. If more precise ground surface elevations are required, we recommend the as-drilled ground surface elevations at the boring locations be determined using traditional survey techniques.

Prior to soil borings operations, we subcontracted a tree clearing company to provide access pathways to the soil boring locations within the wooded areas located near the southwest corner of the DHS campus. The soil borings were performed using an all-terrain vehicle (ATV) mounted drilling rig. Continuous 2-1/4-inch, inside-diameter, hollow-stem augers were used to extend the boreholes to the explored depths. Soil samples were collected at 2-1/2-foot intervals within the upper 10-feet and at 5-foot intervals thereafter. The samples were obtained using the Standard Penetration Test (SPT) method (ASTM D1586), which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30-inches. The sampler is generally driven in three (3) successive 6-inch increments with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12-inches is termed the Standard Penetration Resistance (N). The blow counts for each 6-inch increment and the resulting N-value are presented on the soil boring logs.

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

LABORATORY TESTING

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent to subgrade preparation and foundation design. An experienced geotechnical engineer classified the samples in general conformance with the Unified Soil Classification System. Laboratory testing was conducted in conformance with the following ASTM Test Methods:

- "Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass" (ASTM D2216);
- "Standard Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils" (ASTM D2974); and
- "Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils" (ASTM D4318).

The unconfined compressive strengths were determined using a spring-loaded hand penetrometer. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a spring-loaded cylinder.

The results of the moisture contents, organic matter contents, and unconfined compressive strengths are indicated on the Soil Boring Logs, Figure Nos. 21 through 39, at the depths the samples were obtained. The results of the Atterberg Limits tests are presented graphically in the appendix as Figure No. 40.

We will hold the soil samples for 60 days from the date of this report, at which time they will be discarded. If you would like the samples, please let us know prior to this date.

SITE DESCRIPTION

Dexter High School

The Dexter High School campus is located at 2200 N. Parker Road in Dexter, Michigan. The existing school can be accessed via two access drives leading eastward into the parcel and via an access drive extending southward from Shield Road. The existing site grades are highest near the intersection of Shield and N. Parker Road and gently slope downward as you approach the existing school. The site grades immediately surrounding the existing building are at higher elevations at the northwest end of the building near the entrance of the school and lower toward to the southeast end of the building.

The existing school building is a single to four-story structure with one-story partially below grade at the north end. The campus also includes several soccer fields, two (2) baseball diamonds, ten (10) tennis courts, and a detention pond, as well as associated bituminous concrete service drives and parking areas, and Portland cement concrete (PCC) sidewalks. The remainder of the campus is covered in manicured lawn, includes several mature trees, and isolated areas of dense vegetation.

Existing surface grades throughout the campus range from Elevation 856 to 894 feet. Site grades near the proposed fieldhouse and adjacent parking lots range from Elevation 882 to 894 feet, generally sloping down from north to south or northwest to southeast. Site grades along the proposed service drive generally range from Elevation 893 to 865 feet, generally sloping down in an easterly direction.

Based on historical aerial imagery, the parcel appears to have been used for agricultural purposes prior to construction of the Dexter High School Campus leading up to 1998. Sometime between 1998 and 2005, the Dexter

High School building and northern athletic facilities were constructed. We observe the southwestern wooded area was cleared and twin turf fields were constructed sometime around 2020. We observed crack sealing has been performed throughout the bituminous concrete areas since the original construction of the campus.



Historical Aerial Imagery (1998)



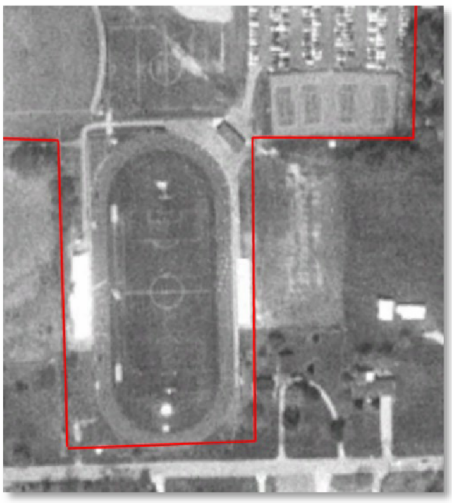
Historical Aerial Imagery (2005)



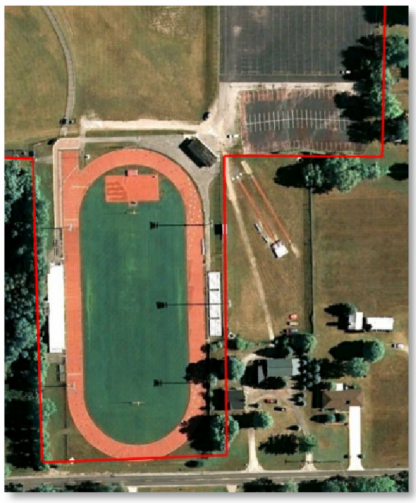
Aerial Imagery (2025)

Al Ritt Stadium

The Al Ritt Stadium is located at 2615 Baker Road in Dexter, Michigan. The stadium is located south of Creekside Intermediate School. The site appears to be relatively flat, sloping down slightly from east to west. The existing football field, running track, bleacher structures, and maintenance building appear to have been constructed sometime prior to 1993. Then, sometime around 2007, the athletic fields north of the football field were demolished and replaced with bituminous concrete parking areas. It appears that the restroom/concessions building located on the north side of the stadium was constructed sometime between 2007 and 2013.



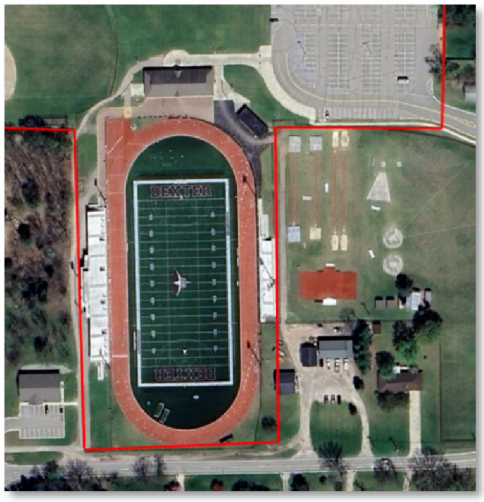
Historical Aerial Imagery (1993)



Historical Aerial Imagery (2007)



Historical Aerial Imagery (2013)



Aerial Imagery (2025)

SOIL CONDITIONS

DHS Fieldhouse Addition (B-21 through B-26 and D&A SB-1, SB-2, and SB-3)

Approximately 3 to 10 inches of topsoil is present at the ground surface of the soil borings. Within soil borings B-21 and B-22, clayey sand and silty clay fill soils underlie the topsoil and extend to an approximate depth of 3-1/2 feet. Alternating layers of native granular and cohesive soils consisting of sand, gravelly sand, silty sand, sandy silt, silty clay, sandy clay, and clayey silt, underlie the topsoil and fill soils and extend to the explored depth of 25 feet below existing grade.

The clayey sand fill is very loose in relative density with an SPT-N value of 2 blows per foot (bpf). The silty clay fill is very stiff in consistency with a moisture content of 19 percent and an unconfined compressive strength of 5,000 pounds per square foot (psf). The native cohesive soils within boring B-21 between 3-1/2 and 8-1/2 feet, within boring B-22 between 13-1/2 and 19-1/2 feet, within boring B-24 between 6 and 13-1/2 feet, and within B-25 between 18-1/2 and 24 feet are stiff in consistency with natural moisture contents between 10 and 21 percent and

unconfined compressive strength ranging from 2,000 to 3,000 psf. The remainder of the native cohesive soils are generally very stiff to hard in consistency with natural moisture contents ranging from 9 to 19 percent and unconfined compressive strength ranging from 4,000 to 9,000 psf. The native sandy clay present below elevations ranging from 867 to 858 feet within soil borings B-24 through B-26 is hard to very hard in consistency with natural moisture contents ranging from 8 to 10 percent, unconfined compressive strengths in excess of 9,000 psf, and SPT N-values ranging from 50 blows for 5 inches of penetration to 50 blows for 1 inch of penetration. The native granular soils are generally loose to medium compact in relative density with SPT N-values ranging from 6 to 27 bpf; however, isolated layers within soil boring B-23 between 23-1/2 and 25 feet and within boring B-25 between 14 and 18-1/2 feet are very loose in relative density with SPT N-values ranging from 3 to 4 bpf.

DHS Fieldhouse Parking, Drive, and Structural BMPs (B-27 through B-35)

Approximately 2 to 7 inches of topsoil is present at the ground surface of borings B-27 through B-35. Within borings B-28, B-31, and B-32, granular and cohesive fill soils consisting of silty clay, sandy clay, and clayey sand underlie the topsoil and extend to approximate depths ranging from 3 and 6 feet. Notably, the silty clay fill within B-28 has an elevated organic matter content. Native granular soils, consisting of silty sand, clayey sand, and sandy silt, are present beneath the fill soils or topsoil within soil borings B-27, B-30, B-31, and B-35 and extend to depths ranging from 3 to 6 feet. Native cohesive soils, consisting of silty clay and sandy clay, generally underlie the upper granular soils and fill soils or topsoil within the remaining borings and extend to depths ranging from 3 feet to the explored depth of 20 feet. Granular soils consisting of clayey sand, sand, gravelly sand, and sandy gravel are present beneath the cohesive soils within soil borings B-27, B-29 through B-31, and B-33 and extend to the explored depth of 10 and 20 feet.

The clayey sand fill is medium compact in relative density with an SPT N-value of 15 bpf. The cohesive fill soils are stiff to very stiff in consistency with moisture contents ranging from 15 to 28 percent and unconfined compressive strengths ranging from 2,000 to 6,000 psf. Within B-28, the silty clay fill has organic matter contents ranging from 4 to 7 percent. The native cohesive soils within B-27 through B-35 are generally stiff to very stiff in consistency with natural moisture contents ranging from 10 to 19 percent and unconfined compressive strengths ranging from 2,500 to 7,000 psf; however, within B-35, the sandy clay between 3-1/2 and 6 feet is medium in consistency with a natural moisture content of 12 percent and an unconfined compressive strength of 1,500 psf. Within B-32, the silty clay has a liquid limit of 21 percent and a plasticity index of 6 percent. The native granular soils are generally loose to medium compact in relative density to approximate depths of 3 to 8-1/2 feet with SPT N-values ranging from 5 to 24 bpf. The native granular soil present below these depths are generally medium compact to compact with N-values ranging from 15 to 41 bpf.

Al Ritt Stadium Lighting (B-36 through B-39)

Approximately 1 to 2 feet of crushed limestone aggregate is present at the ground surface of borings B-36 and B-37. Approximately 7 inches of topsoil is present at the ground surface of boring B-38. Within boring B-37 and B-38, granular fill soils consisting of silty sand and sand underlie the aggregate or topsoil and extend to approximate depths ranging from 4-3/4 to 6 feet. In general, native granular soils consisting of silty sand and sand are present beneath the fill soils or from the ground surface and extend to depths ranging from 8-1/2 to 13-1/2 feet. Silty clay and sandy clay underlie the fill soils within soil boring B-38 the native granular soils and generally extend to the explored depths ranging from 30 to 35 feet. A layer of gravelly sand is present below an approximate depth of 34-1/2 feet within soil boring B-39.

The silty sand fill is loose to medium compact in relative density with and SPT N-value ranging from 5 to 17 bpf. The native granular soils are very loose to loose in relative density within soil boring B-37 with SPT N-values ranging from 3 to 10 bpf. Elsewhere, the native granular soils are generally loose to medium compact in relative density

with N-values ranging from 6 to 23 bpf. However, the deeper native gravelly sand within boring B-39 is very compact in relative density with an SPT N-value in excess of 50 bpf. The native sandy clay present between the approximate depths of 8-1/2 and 13 feet within soil boring B-39 is very stiff in consistency with a natural moisture content of 13 percent and an unconfined compressive strength of 4,000 psf. Elsewhere, the native cohesive soils are hard to very hard in consistency with natural moisture contents ranging from 7 to 11 percent, unconfined compressive strengths of 9,000 psf or greater, and N-values ranging from 29 bpf to 50 blows for 2 inches of penetration.

General

Although no environmental sampling protocol was used for the drilling operations, a hydrocarbon odor was noted in the native sandy clay within soil borings B-25 and B-33 between the approximate depths of 3 and 6 feet, which indicates the presence of possible subsurface contamination.

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

The Soil Boring Location Plans, Plate Nos, 1 and 2, and Soil Boring Logs, Figure Nos. 21 through 39, are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the soil boring logs and elsewhere in this report are presented on Figure No. 41.

GROUNDWATER CONDITIONS

DHS Fieldhouse Addition (B-21 through B-26 and D&A SB-1, SB-2, and SB-3)

During drilling operations, groundwater was encountered at approximate depths ranging from 7 to 20 feet below existing grade within soil borings B-21 through B-26, corresponding to elevations ranging from 869 to 878-1/2 feet. The groundwater level was measured at depths ranging from 7 to 19-1/2 feet upon completion of drilling, which corresponds to elevations ranging from 872 to 878-1/2 feet and corresponds with the collapse depth of the borehole. With SB-1 and SB-2, no measurable groundwater was observed at completion of drilling above the collapse depth, which was higher than the encountered groundwater level within these borings.

DHS Fieldhouse Parking, Drive, and Structural BMPs (B-27 through B-35)

During drilling operations, groundwater was encountered at approximate depths ranging from 10 to 19 feet below existing grade within soil borings B-27 through B-29 and B-31, corresponding to elevations ranging from 871 to 877-1/2 feet. The groundwater level was measured at depths ranging from 12 to 17-1/2 feet upon completion of drilling, which corresponds with elevations ranging from 866-1/2 to 880 feet and generally correspond with the collapse depths within these borings. No measurable groundwater was observed during or upon completion of drilling operations within borings B-30 or B-32 through B-35.

Al Ritt Stadium Lighting (B-36 through B-39)

During drilling operations, groundwater was encountered at approximate depths ranging from 5 to 7 feet below existing grade within soil borings B-36 through B-39. The groundwater level was measured at depths ranging from

6 to 29 feet upon completion of drilling within B-36 through B-38, which corresponds with the collapse depth of the boreholes. No measurable groundwater was observed upon completion of drilling within soil boring B-39.

General

The rise in the groundwater level above the encountered elevation within soil borings B-22, B-23, and B-31 may be indicative of an artesian condition.

Fluctuations in perched and long-term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation. It should also be noted that groundwater observations made during drilling operations in predominantly cohesive soils are not necessarily indicative of the static groundwater level. This is due to the low permeability of such soils and the tendency of drilling operations to seal off the natural paths of groundwater flow.

SITE PREPARATION RECOMMENDATIONS

General

Existing fill soils are present within borings B-21, B-22, B-28, B-31, and B-33. The fill soils do not appear to have been placed in an engineered manner, include intermixed debris, and have organic matter contents ranging from 4.3 to 7.0 percent. Considering the existing ground surface elevations and the fieldhouse FFE, we anticipate the fill soils within the influence of the fieldhouse will be removed while adjusting site grades to achieve the design subgrade elevation, as illustrated on the Soil Boring Profile, Figure No. 42, in the Appendix. In addition, based on proposed pavement finished grades, we anticipate the existing fill soils will be removed during grading operations in the vicinity of soil borings B-28 and B-31. Some existing fill soil may remain beneath the proposed pavement section within the vicinity of soil boring B-33. The fill within soil boring B-33 does not contain any notable organic matter or debris and is generally considered suitable for support of the pavement, following the successful completion of a proof-roll/proof-compaction evaluation.

We anticipate earthwork operations will consist of the complete removal of trees, vegetation, and topsoil within the influence of the development areas, removal of any existing utilities within the influence of the fieldhouse, raising/lowering site grades to achieve design subgrade elevation, proof-rolling/proof-compacting the exposed subgrade, excavating for utilities, foundations, and structural BMPs, and preparing subgrade for floor slab and pavement support. We recommend all earthwork operations be performed in accordance with comprehensive specifications and be properly monitored in the field by qualified personnel under the direction of a licensed professional engineer.

At the start of earthwork operations, any existing trees, vegetation, and topsoil should be entirely removed within the proposed development areas. Any existing utilities and associated backfill within the structure footprint(s) should be completely removed and replaced with engineered fill. Where utilities lie outside the structures zone of influence, utilities to be abandoned can be filled with cementitious grout and left-in-place.

After site stripping, and cutting the site to rough grade, the exposed subgrade is expected to generally consist of native granular and cohesive soils. Prior to placement of engineered fill to raise site grades, where cohesive soils are present, soils should be proof-rolled with a fully loaded tandem-axle dump truck and be evaluated for stability. Unsuitable soils exhibiting excessive instability, such as severe rutting, should be improved with additional compaction or undercut to expose stable soils. Where granular soils are present, soils should be proof-compacted with a heavy smooth-drum vibratory roller and should be visually evaluated for instability and/or unsuitable soil conditions by a qualified geotechnical engineer or technician. We recommend 10 passes in two (2) perpendicular

directions during the proof-compaction operations. We recommend that the vibratory setting be turned off when within 25 feet of any existing structures. Any resulting undercut excavations should be evaluated for stability, improved as necessary, and should be backfilled with engineered fill.

Based on conducted laboratory testing, the moisture content of the surficial cohesive soils are approaching their respective plastic limit. Therefore, these subgrade soils may become unstable under repeated loading from construction equipment. The subgrade should not be exposed to prolonged periods of precipitation to prevent the subgrade from becoming unstable. We recommend earthwork operations be performed during the predominantly drier summer months.

Engineered Fill

In general, we anticipate that the spoils generated from grade balancing within the influence of the fieldhouse and structural BMP excavations can be re-used as engineered fill elsewhere on site. However, soils including intermixed construction debris and/or organic matter should not be used as engineered fill throughout the proposed development areas, such as those observed within soil borings B-21 through B-23 and B-28.

Engineered fill should be free of organic matter, frozen soil, clods, or harmful material. The fill should be placed in uniform horizontal layers not more than 9-inches in loose thickness. The engineered fill should be compacted to achieve a dry density corresponding with 95 percent of the maximum dry density as determined by the Modified Proctor Compaction test (ASTM D1557).

To economically conduct earthwork operations at the site, imported fill, adhering to the aforementioned requirements, should consist of low plasticity clays or well-graded aggregates. Low plasticity clays, having a plasticity index less than 20 percent, should be placed within +3 or -1 percent of the optimum moisture content as determined by the Modified Proctor Test. For well-graded aggregates, such as MDOT Class II sand, we recommend the engineered fill be placed at ±2 percent of the optimum moisture content as determined by ASTM D1557.

We recommend the use of free-draining granular soils, such as MDOT Class II sand, within utility trenches and to backfill around below-grade walls. We recommend the use of engineered fill with a sufficient amount of fines (material passing the No. 200 sieve) in order to facilitate trenching and excavation techniques for strip and spread footing foundations.

FOUNDATION RECOMMENDATIONS

Information regarding structural loading conditions associated with the fieldhouse and stadium light poles were unavailable at the time of this report. It is assumed that the fieldhouse will have column loads ranging from 75 to 150 kips and wall loads ranging form 3 to 6 kips per lineal foot. Once information regarding structural loading conditions becomes available, G2 should be notified to re-evaluate the recommendations provided herein, if necessary.

Dexter High School Fieldhouse

Very loose clayey sand and very stiff silty clay fill is present within borings B-21 and B-22 near the northeast corner of the fieldhouse location. Considering the ground surface elevation at boring B-21 and B-22 range from 893 to 894 feet and the fieldhouse FFE is 887-1/2 feet, we anticipate the fill soils will be removed during grading operations to achieve the design subgrade elevation.

We recommend the fieldhouse be supported by shallow conventional strip and/or spread footings designed to bear at a minimum depth of 3-1/2 feet below finished grades within the native loose to medium compact granular soils, very stiff to hard cohesive soils, or engineered fill. Foundations bearing within the above mentioned soils can be designed based on a net allowable bearing capacity of 2,500 psf.

Al Ritt Stadium Lighting

Loading conditions for the proposed light pole foundations was not available at the time of this report. However, based on our experience, we anticipate the light poles will be supported on drilled shaft foundations. We anticipate the drilled shafts will extend into the hard clay layer present at depths ranging from 6 to 13-1/2 feet in order to provide the necessary lateral support. The drilled shaft design is controlled by the overturning moment, thus bearing pressure imposed on the drilled shaft bottom is less than the recommended allowable bearing pressure of 9,000 psf. We recommend drilled shafts be designed using the following soil parameters:

Boring No.	Depth (feet)	Soil	Cohesion (psf)	Angle of Friction (degrees)	Total Unit Weight (pcf)	Soil Modulus (pci)
B-36	0 to 3-1/2	-	-	-	-	-
	3-1/2 to 5	Medium Compact Sand	0	32	120	90
	5 to 8-1/2	Medium Compact Sand	0	32	120	60
	8-1/2 to 14-1/2	Hard Clay	4,500	0	135	700
	14-1/2 to 30	Hard to Very Hard Clay	8,000	0	140	800
B-37	0 to 3-1/2	-	-	-	-	-
	3-1/2 to 6	Loose Sand	0	30	115	25
	6 to 13-1/2	Loose Sand	0	30	115	20
	13-1/2 to 17	Hard Clay	5,000	0	135	750
	17 to 30	Hard to Very Hard Clay	8,000	0	140	800
B-38	0 to 3-1/2	-	-	-	-	-
	3-1/2 to 5	Medium Compact Sand	0	32	120	90
	5 to 6	Medium Compact Sand	0	32	120	60
	6 to 9-1/2	Hard Clay	4,500	0	135	700
	9-1/2 to 30	Hard Clay	5,000	0	135	750
B-39	0 to 3-1/2	-	-	-	-	-
	3-1/2 to 6-1/2	Loose Sand	0	30	115	25
	6-1/2 to 8-1/2	Loose Sand	0	30	115	20
	8-1/2 to 13	Very Stiff Clay	2,000	0	130	300
	13 to 22	Hard Clay	5,000	0	135	750
	22 to 27	Hard to Very Hard Clay	8,000	0	140	800
	27 to 34-1/2	Hard Clay	5,000	0	135	750

General

Continuous wall or strip footings should be at least 18 inches in width and isolated spread footings should be at least 36 inches in their least dimension. Exterior foundations must bear at a minimum depth of 3-1/2 feet below finished grade for protection against frost heave. Interior footings may bear at shallower depths provided they extend through fill soils, suitable bearing materials are available for support, and foundations are continuously protected from frost penetration during construction.

To achieve a change in the level of a strip footing, the footing should be gradually stepped at a grade no steeper than two horizontal units to one vertical unit (2H:1V). If required to construct foundations at different levels, adjacent spread foundation should be designed and constructed so the least lateral distance between the foundations is equivalent to or more than the difference in their bearing levels.

If the recommendations outlined in this report are adhered to, total and differential settlements for the completed structures should be within 1 inch and ½ inch, respectively. We expect settlements of these magnitudes are within tolerable limits for the type of structures proposed. We recommend all foundations be suitably reinforced to minimize the effects of differential settlements associated with local variations in subsoil conditions.

FLOOR SLAB RECOMMENDATIONS

As previously stated, we anticipate the fill soils encountered within borings B-21 and B-22 will be removed in order to achieve the design subgrade elevation within the influence of the fieldhouse. The fieldhouse will have a FFE of 887-1/2 feet and we anticipate the floor slab will be supported by native granular/cohesive soils and/or engineered fill overlying native soils.

Following satisfactory completion of the subgrade preparation recommendations as described within the *SITE PREPARATION RECOMMENDATIONS* section of this report, a subgrade modulus (k) of 125 pounds per cubic inch (pci) may be used for design of the fieldhouse floor slab supported by the aforementioned soils.

We recommend at least 4-inches of clean free-draining material, such as 2NS sand or pea gravel, be placed between the subgrade and the bottom of the floor slab for use as a capillary break to reduce moisture transmission through the concrete floors and to reduce the potential for concrete curling. If moisture sensitive floor coverings are planned or if greater protection against vapor transmission is desired, a vapor barrier consisting of 10-mil plastic sheeting, or equivalent, may be placed on the sand layer beneath floor slabs. However, additional floor slab curing techniques will be required especially if floor slab placement occurs in the winter months to prevent floor slab curling. The floor slab should be isolated from the foundation system to allow for independent movement.

PAVEMENT RECOMMENDATIONS

General

We understand that a bituminous concrete service drive and parking areas will be constructed near the fieldhouse. Information regarding anticipated traffic frequencies was unavailable at the time of this report; however, we understand a heavy-duty pavement section will be constructed. It is assumed that traffic will primarily consist of PCVs and school buses with occasional waste management, emergency response, and delivery vehicles. Once information regarding anticipated traffic frequencies becomes available, G2 should be notified to re-evaluate the recommendations provided herein.

We anticipate some subgrade instability will be encountered throughout the pavement areas depending on the time of year of construction. We recommend limiting undercuts to a depth of 12 inches below proposed aggregate base, compacting the exposed subgrade, and backfilling with MDOT 21AA dense-graded aggregate. If a stable subgrade cannot be achieved at a maximum depth of 12 inches below the proposed subgrade, we recommend placing a geogrid reinforcement, such as TENSAR Tri-Ax geogrid (Type III) or equivalent, at a depth of 12 inches below proposed subgrade and backfilling with MDOT 21AA aggregate. The geogrid should extend to a minimum of 5 feet beyond the edges of the unstable area. Any undercut areas within predominantly clayey soils should be connected with finger drains to the closest catch basins to drain water from within the granular undercut backfill material.

Pavement Design

Provided the site recommendations in the *SITE PREPARATION RECOMMENDATIONS* section of this report are adhered to, we recommend a subgrade resilient modulus of 6,000 pounds per square inch (psi) be used for the anticipated subgrade soils. Based on the anticipated traffic frequencies, we have designed a heavy-duty bituminous concrete pavement section based on an estimated 300,000 equivalent single axle loads (ESALs) over a 20-year design life. For evaluation purposes, we estimated a serviceability loss of 2.2, a standard deviation of 0.45, and a reliability of 90 percent. Based on the results of our analysis, we recommend the following minimum pavement design cross-section:

Typical Heavy-Duty Flexible Pavement Section

Material	Thickness	Structural Coefficient
MDOT 5EML Bituminous Wearing Course	2 inches	0.42
MDOT 4EML Bituminous Leveling Course	3 inches	0.42
MDOT 21AA Aggregate Base (dense-graded)	10 inches	0.14
		Total SN = 3.5

Large front-loading refuse trucks can impose significant concentrated wheel loads within trash dumpster pick-up areas and loading and delivery areas. This type of loading can result in rutting of bituminous concrete pavements and ultimately in failure. Therefore, we recommend reinforced Portland cement concrete pavement be used in this area and be large enough to accommodate the entire truck during pick-up operations.

All pavement materials are specified within the 2020 Standard Specifications for Construction from the Michigan Department of Transportation. The bituminous pavement materials are described in Section 501 and 904 and can be assigned a structural coefficient number of 0.42. The Portland cement concrete pavement materials are described in Section 601. Any imported MDOT 21AA dense-graded aggregate base course can be assigned a structural coefficient number of 0.14. The aggregate materials for the subbase are described in Section 902. We recommend that bituminous concrete utilize grade PG 68-22 binder, with no more than 17 percent of the overall binder content from reclaimed asphalt pavement (RAP) within the top wearing course layer.

Pavement Drainage and Maintenance

Proper drainage is an important consideration for pavement design, especially in consideration of the cohesive soils. The pavement and subgrade should be properly sloped to promote effective surface and subsurface drainage and prevent water ponding. We recommend edge drains be installed around the perimeter of the pavement areas.

Regular timely maintenance should be performed on the pavement to reduce the potential deterioration associated with moisture infiltration through surface cracks. The owner should be prepared to seal the cracks with a hot-applied elastic crack filler as soon as possible after cracking develops and as often as necessary to block the passage of water to the subgrade soils.

STRUCTURAL BMP RECOMMENDATIONS

We understand that structural BMPs consisting of a detention pond and two (2) underground stormwater management structures will be constructed adjacent to the fieldhouse. The detention pond will be constructed on the east side of the fieldhouse and the two (2) underground stormwater management structures will be constructed below the parking areas on the east and west sides of the fieldhouse. The invert elevations of the BMPs were unavailable at the time of this report. Once this information becomes available, G2 should be notified to re-evaluate the recommendations provided herein. We understand the intent of the BMPs are to capture and detain stormwater runoff until redirected to the natural water cycle by means of subsurface infiltration.

Soil borings B-27 and B-28 were drilled within the vicinity of the proposed west underground stormwater structure, soil boring B-29 was drilled within the proposed detention pond, and soil borings B-30 and B-31 were drilled in the vicinity of the east underground stormwater structure. Following grade cuts, the soils within borings B-27 and B-28 are cohesive in nature, which can be considered relatively impermeable and do not promote subsurface infiltration. Site grades will be raised by several feet in the area of the detention pond. Predominantly cohesive soils are also present within soil boring B-29 to an approximate depth of 8-1/2 feet, or approximately 11-1/2 feet below proposed grade. We do not anticipate the proposed detention pond will extend below 11-1/2 feet; therefore, the detention pond should be expected to retain water and an overflow structure will be required. Sand and gravelly sand are present within soil borings B-30 and B-31 at depths of 2-1/2 to 6 feet below proposed finished grade and extend to depths ranging from 7-1/2 to 20 feet below finished grade. We anticipate these soils will allow for subsurface infiltration beneath the eastern parking lot.

Per Washtenaw County guidelines, each BMP must have an invert elevation three (3) feet above the seasonally high groundwater table. The granular soils within borings B-30 and B-31 could promote subsurface infiltration, provided the BMP invert is sufficiently above the seasonally high groundwater table. Once the BMP invert elevations become available, we recommend that supplemental test pit excavations and in-situ infiltration testing be performed at each BMP location.

CONSTRUCTION CONSIDERATIONS

Open Cut Excavations

We anticipate caving and/or sloughing of the surficial granular soils during shallow foundation excavation operations. As such, the foundation contractor should come prepared to over-excavate and form foundation excavations within the granular soils. Where cohesive soils are present, we anticipate foundations can be earth formed. If earth formed foundations are utilized, we recommend foundation excavation and concrete placement operations be conducted on the same day to minimize potential for cave-ins or stormwater run-off into the open excavations.

Based on the observations within soil borings B-21 through B-35, groundwater is present below Elevations 871 to 878-1/2 feet. However, based on the proposed FFE of 887-1/2 feet, we do not anticipate construction excavations for the proposed fieldhouse, utilities, or BMPs will extend below the groundwater table. We anticipate any groundwater seepage or surface runoff can be controlled with a properly constructed system of sumps and pumps.

We recommend maximum slope inclinations of 2H:1V within the very loose to loose granular soils, 1-1/2H:1V within the medium compact granular and medium cohesive soils, 1H:1V within the compact granular and stiff cohesive

soils, and 3/4H:1V within the very stiff to hard cohesive soils for excavations extending below a depth of 5 feet. Where seepage from excavation cuts is observed, the slopes will need to be flattened sufficiently to achieve stability, but in no case left steeper than 3H:1V at and below the seepage level.

All excavations should be safely sheeted, shored, sloped, or braced in accordance with MI-OSHA requirements. If material is stored or equipment is operations near an excavation, lower angle slopes or stronger shoring must be used to resist the extra pressure due to the superimposed loads.

Drilled Piers

Caving and/or sloughing of the granular soils will occur during drilled shaft excavation operations. In addition, groundwater was encountered at depths ranging from 5 to 7 feet below existing grade. Therefore, the drilled pier contractor should come to the site prepared to extend temporary steel casing through the granular soils and into the underlying cohesive soils to maintain a stable excavation and seal off groundwater during construction operations. The contractor should also come to the site prepared to break-up and remove any cobbles encountered in the excavation and may need a rock auger to excavate through the very hard cohesive soils. Under no circumstances should concrete fall through standing water at the base of the excavation. Therefore, if groundwater cannot be controlled with temporary casing, concrete must be placed by tremie method.

Once drilling is completed to the design depth, reinforcing steel should be set and concrete placed until a positive head of concrete has been established within the casing. This positive concrete head should be maintained while pulling the casing to prevent sloughing of the granular soils into the fresh concrete. After concrete has been placed to an appropriate grade, the casing may be removed and concrete placement operations completed. The telescoped casing, if used, must be removed in the opposite order in which it is installed (i.e. – from the inside out).

To reduce lateral movement of the drilled pier foundations, the contractor must place the concrete for the pier in intimate contact with undisturbed soil. Fill any voids or enlargements in the drilled pier shaft excavation with concrete at the time of drilled pier concrete placement. We recommend using a concrete mix design with a slump of 5 to 7 inches for free fall placement and 7 to 9 inches for tremie placement to reduce the potential for concrete arching and provide a workable material.

We recommend using a short temporary top form, such as a Sonotube, to form the top portion of the drilled pier. The use of this top form is a beneficial aid to the correct placement and orientation of the anchor bolts.

Directional Drilling Installation

We understand electrical conduits will be installed via direction drilling beneath the existing football field at Al Ritt Stadium. In general, we anticipate the soil conditions will be conducive to directional drilling installation methods; however, some degree of difficulty may be encountered as the directional drilling cutting head approaches the interface between the very stiff to hard cohesive and very loose to loose granular soils. We recommend an experienced contractor with the resources to provide appropriate designs as well as provide the proper equipment to penetrate the anticipated soils perform the installation operations.

Drilling fluid should be used during drilling and back-reaming operations. Drilling fluid should be composed of environmentally clean water and should be amended using appropriate additives for the specific soil types to be encountered. Potentially hazardous materials should not be used in drilling fluid. Based on the soil conditions at the site, we recommend the fluid pressure and pumping rate for pilot drilling and pre-ream be commensurate with the subsurface conditions and the drilling fluid viscosity and density be appropriate for the anticipated variations of the subsurface conditions.

We recommend the drilling contractor periodically evaluate the specific gravity, unit weight, and sand content of the drilling fluid to mitigate the potential for the buildup of excess pressure behind the cutting head.

GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report relative to site preparation and foundation construction on the basis of data provided to us relating to the project location and surface grade for the proposed site(s). Any significant change in this data should be brought to our attention for review and evaluation with respect to prevailing subsurface conditions. Furthermore, if changes occur in the design, location, or concept of the project, conclusions and recommendations contained in this report are not valid unless G2 reviews the changes. G2 will then confirm the recommendations presented herein or make changes in writing.

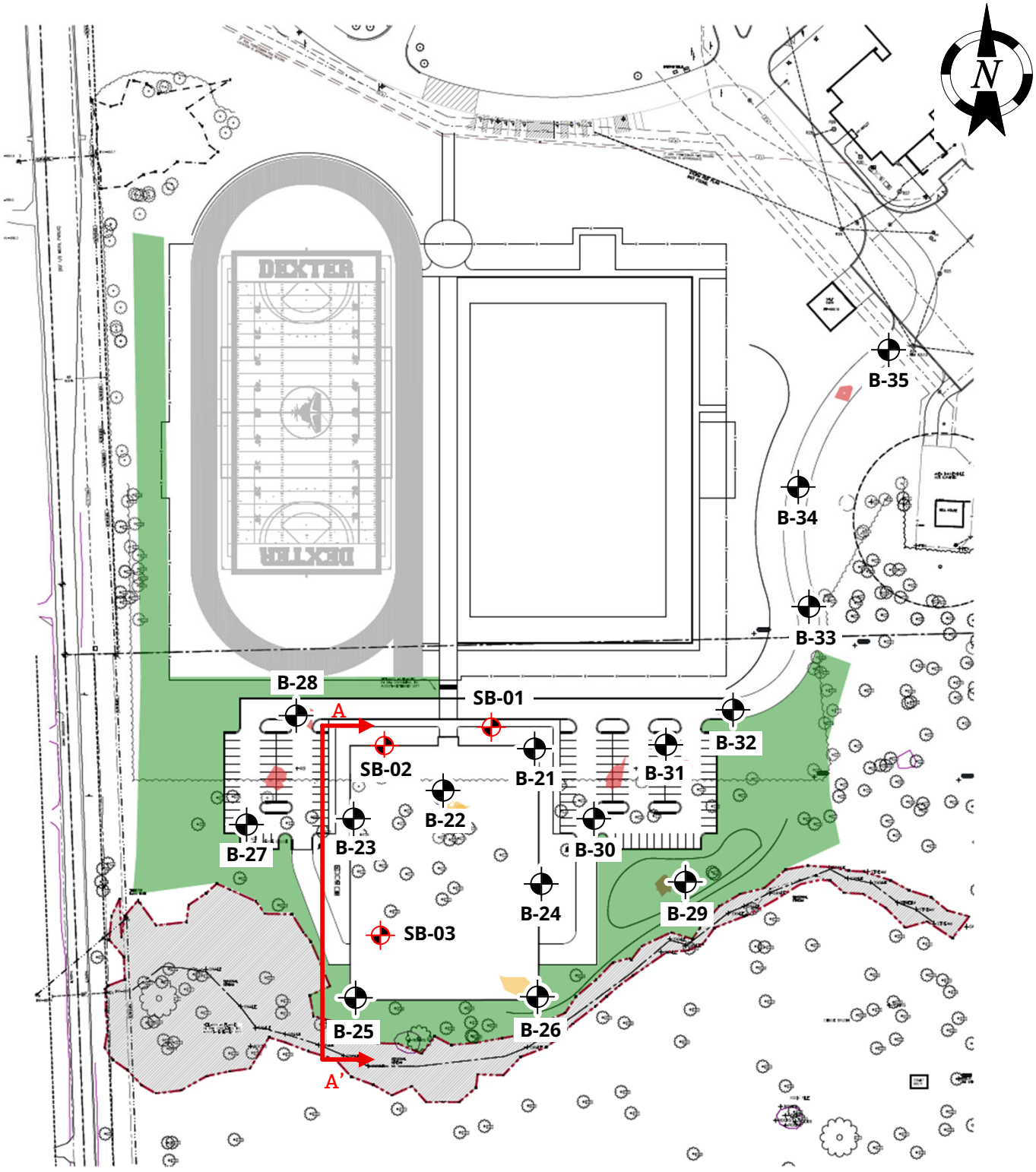
The scope of the present investigation was limited to evaluation of subsurface conditions for the support of proposed structures and other aspects of the proposed improvements. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation.

We base the analyses and recommendations submitted in this report upon the data from the soil borings performed at the approximate locations shown on the Soil Boring Location Plans, Plate Nos. 1 and 2. This report does not reflect variations that may occur between the actual boring locations and the actual structure locations. The nature and extent of any such variations may not become clear until the time of construction. If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations.

We recommend G2 Consulting Group, LLC observe all geotechnical related work, including subgrade preparation, foundation construction, and engineered fill placement. G2 Consulting Group, LLC will perform the appropriate testing to confirm the geotechnical conditions given in the report are found during construction.

APPENDIX

SOIL BORING LOCATION PLANS	PLATE NOS. 1 AND 2
SOIL BORING LOGS	FIGURE NOS. 21 THROUGH 39
SOIL BORING PROFILE A-A'	FIGURE NO. 40
ATTERBERG LIMITS TEST RESULTS	FIGURE NO. 41
GENERAL NOTES TERMINOLOGY	FIGURE NO. 42
DRIESENGA & ASSOCIATES, INC. SOIL BORING LOGS	



Legend

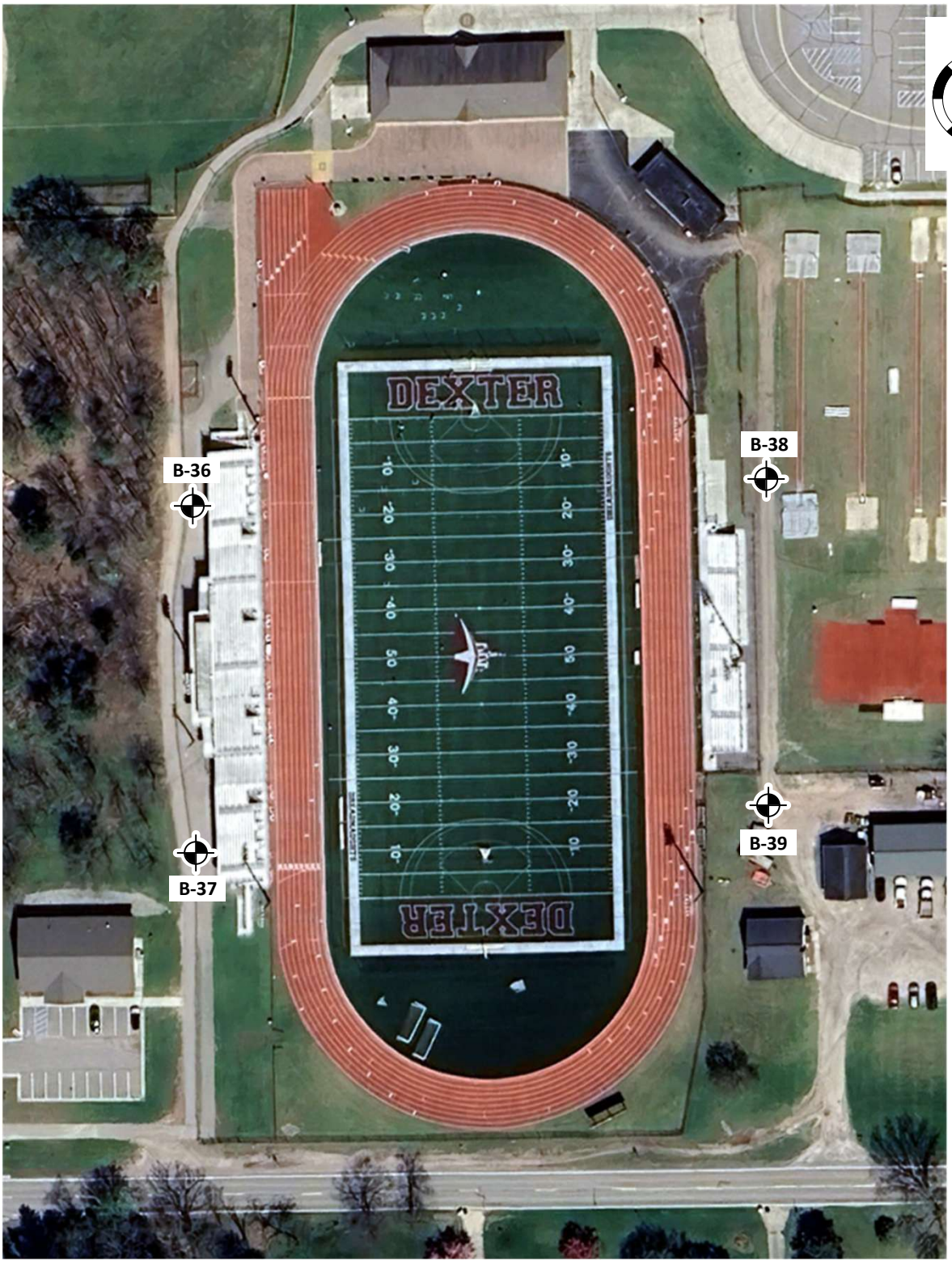
- Soil Borings performed by 2G Drilling between December 1, 2025 and December 8, 2025
- Preliminary soil sorings performed by others

Soil Boring Location Plan

2025 Dexter Bond Program
DHS Fieldhouse and Site Improvements
2200 N. Parker Road
Dexter, Michigan 48130

2G CONSULTING GROUP Smart.Results.Fast.

Project No. 253566	
Drawn by: TSH	
Date: 1-5-2026	Plate No. 1
Scale: NTS	



Legend

Soil Borings perform by 2G Drilling between December 1, 2025 and December 8, 2025

Soil Boring Location Plan		
2025 Dexter Bond Program Al Ritt Stadium Lighting 2521 Baker Road Dexter, Michigan 48130		
2G CONSULTING GROUP Smart.Results.Fast.	Project No. 253566	
	Drawn by: TSH	
	Date: 1-5-2026	Plate No. 2
	Scale: NTS	

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31903° Longitude: -83.89737°

Soil Boring No. B-21

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 894.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Sand (10 inches) 0.8							
		Fill: Very Loose Brown Clayey Sand; intermixed wood chips		S-01	3 1 1	2			
		3.5							
889.0		Stiff Brown Silty Clay with trace sand and gravel	5	S-02	2 5 4	9	20.7		2500*
				S-03	2 5 3	8	13.8		2500*
		8.5							
884.0		Loose to Medium Compact Brown Sand with trace silt and gravel	10	S-04	3 5 4	9			
879.0			15	S-05	4 13 14	27			
		18.5							
874.0		Medium Compact Brown Gravelly Sand	20	S-06	14 8 10	18			
		22.5							
869.0		Medium Compact Brown Clayey Sand with trace silt and gravel 25.0	25	S-07	3 4 8	12			
		End of Boring @ 25 ft							
864.0			30						

Total Depth: 25 ft
Drilling Date: December 1, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
20 feet during drilling operations; wet cave at 19-1/2 feet after auger removal

Notes:
Borehole collapsed at 19-1/2 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 21

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31895° Longitude: -83.89776°

Soil Boring No. B-22

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 893.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sandy Clay (4 inches) 0.3							
		Fill: Very Stiff Brown Silty Clay with trace sand and gravel; intermixed roots		S-01	2 4 6	10	19.0		5000*
		3.5							
888.0			5	S-02	3 7 8	15	11.8		7000*
				S-03	3 7 10	17	12.9		9000*
		Very Stiff to Hard Brown Silty Clay with trace sand and gravel; occasional sand seams							
883.0			10	S-04	2 4 7	11	10.6		5000*
		13.5							
878.0			15	S-05	1 2 4	6	12.1		2000*
		Stiff Gray Sandy Clay with trace silt and gravel							
		19.5							
873.0			20	S-06	2 4 6	10	13.3		4000*
		Very Stiff Grayish Brown Sandy Clay with trace silt and gravel; occasional sand layers							
		23.5							
		Medium Compact Gray Gravelly Sand 25.0							
868.0			25	S-07	4 7 9	16			
		End of Boring @ 25 ft							
863.0			30						

Total Depth: 25 ft
Drilling Date: December 1, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
20 feet during drilling operations; wet cave at 18-1/2 feet after auger removal

Notes:
Borehole collapsed at 18-1/2 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 22

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31879° Longitude: -83.89816°

Soil Boring No. B-23

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 892.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Clay (4 inches) 0.3							
		Hard Brown Silty Clay with trace sand and gravel; intermixed roots		S-01	7 12 14	26	17.5		9000*
		3.0							
887.0		Hard Brown Sandy Clay with trace silt and gravel; occasional sand seams	5	S-02	10 11 17	28	10.8		9000*
		7.0		S-03	6 6 9	15			
882.0		Medium Compact Brown Sand with trace silt and gravel; occasional clayey sand layers	10	S-04	4 6 7	13			
		14.5							
877.0		Hard Gray Sandy Clay with trace gravel	15	S-05	1 17 25	42	9.6		9000*
		19.0							
872.0		Medium Compact Gray Clayey Sand with trace silt and gravel	20	S-06	3 7 6	13			
		23.5							
867.0		Very Loose Gray Clayey Sand with trace silt and gravel 25.0	25	S-07	1 1 2	3			
		End of Boring @ 25 ft							
862.0			30						

Total Depth: 25 ft
Drilling Date: December 3, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
20 feet during drilling operations; wet cave at 18-1/2 feet after auger removal

Notes:
Borehole collapsed at 18-1/2 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 23

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.3186° Longitude: -83.89735°

Soil Boring No. B-24

CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: 886.0 ft

ELEV. (ft)	PRO-FILE		DEPTH (ft)
		Topsoil: Dark Brown Clayey Sand (6 inches) — 0.5	
		Medium Compact Reddish Brown Clayey Sand with trace silt and gravel — 3.5	
881.0		Medium Compact Brown Clayey Sand with trace silt and gravel — 6.0	5
876.0		Stiff Brown Sandy Clay with trace silt and gravel — 13.5	10
871.0		Compact Gray Sandy Silt — 18.5	15
866.0		Hard Gray Sandy Clay with trace silt and gravel; occasional cobbles (Hardpan) — 25.0	20
861.0		End of Boring @ 25 ft	25
856.0			30

SOIL SAMPLE DATA

SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
S-01	3 7 8	15			
S-02	4 7 9	16			
S-03	3 5 6	11	10.3		3000*
S-04	4 7 9	16	14.0		2000*
S-05	8 13 18	31			
S-06	16 50/5"	---	8.2		9000*
S-07	47 50/5"	---	8.6		9000*

Total Depth: 25 ft
Drilling Date: December 2, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
15 feet during drilling operations; wet cave at 15 feet after auger removal

Notes:
Borehole collapsed at 15 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 24

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31825° Longitude: -83.89815°

Soil Boring No. B-25

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 885.5 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sandy Clay (7 inches) 0.6							
				S-01	6 7 9	16	9.4		9000*
		Hard Mottled Brown and Gray Sandy Clay with trace silt and gravel							
880.5		(Mild hydrocarbon odor)	5	S-02	7 7 8	15	15.9		8000*
		6.0		S-03	3 7 8	15			
875.5		Medium Compact Brown Sand with trace silt and gravel	10	S-04	15 12 13	25			
		14.0							
870.5		Very Loose Gray Sandy Silt	15	S-05	1 1 3	4			
		18.5							
865.5		Stiff Gray Sandy Clay with trace silt and gravel; occasional clayey sand seams	20	S-06	3 3 4	7	14.5		3000*
		24.0							
860.5		Hard Gray Sandy Clay with trace silt and gravel (Hardpan) 25.0	25	S-07	70 50/1"	---	8.6		9000*
		End of Boring @ 25 ft							
855.5			30						

Total Depth: 25 ft
Drilling Date: December 2, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
7 feet during drilling operations; wet cave at 7 feet after auger removal

Notes:
Borehole collapsed at 7 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 25

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31825° Longitude: -83.89735°

Soil Boring No. B-26

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 882.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Clayey Sand (7 inches) 0.6							
		Medium Compact Brown Clayey Sand with trace silt and gravel		S-01	4 5 7	12			
		3.0							
877.0		Loose Brown Silty Sand with trace gravel	5	S-02	6 5 4	9			
		6.0							
		Loose Brown Clayey Sand with trace silt and gravel		S-03	2 3 4	7			
		8.0							
872.0		Compact Brown Gravelly Sand with trace silt	10	S-04	5 10 21	31			
		13.5							
867.0		Very Stiff Gray Clayey Silt	15	S-05	8 11 16	27	15.4		6000*
		19.0							
862.0		Hard Gray Sandy Clay with trace silt and gravel; occasional sand layers	20	S-06	14 23 25	48	10.0		9000*
		24.0							
857.0		Hard to Very Hard Gray Sandy Clay with trace silt and gravel (Hardpan) 25.0	25	S-07	26 50/5"	---	10.2		9000*
		End of Boring @ 25 ft							
852.0			30						

Total Depth: 25 ft
Drilling Date: December 2, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
7 feet during drilling operations; wet cave at 8-1/2 feet after auger removal

Notes:
Borehole collapsed at 8-1/2 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 26

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/9/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31879° Longitude: -83.89861°

Soil Boring No. B-27

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 892.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sandy Clay (5 inches) 0.4							
		Compact Brown Silty Sand with trace gravel; occasional sandy clay layers		S-01	11 17 28	45			
		3.5							
887.0		Hard Mottled Brown and Gray Sandy Clay with trace silt and gravel	5	S-02	11 11 8	19	17.1		9000*
				S-03	6 10 12	22	9.5		9000*
		8.0							
882.0		Very Stiff Brown Sandy Clay with trace silt and gravel; occasional sand seams	10	S-04	5 8 10	18	12.1		7000*
		13.5							
877.0		Stiff Gray Sandy Clay with trace silt and gravel	15	S-05	2 2 4	6	10.0		2500*
		18.5							
872.0		Loose Gray Clayey Sand with trace silt and gravel 20.0	20	S-06	4 4 6	10			
		End of Boring @ 20 ft							
867.0			25						
862.0			30						

Total Depth: 20 ft
Drilling Date: December 3, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
17-1/2 feet during drilling operations; wet cave at 17-1/2 feet after auger removal

Notes:
Borehole collapsed at 17-1/2 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 27

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31914° Longitude: -83.89836°

Soil Boring No. B-28

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 892.5 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Clay (6 inches) 0.5							
		Fill: Very Stiff Mottled Brown and Gray Silty Clay with trace sand and gravel; intermixed organic matter (Organic Matter Content = 4.3%)		S-01	4 10 7	17	17.6		6000*
		3.5							
887.5		Fill: Stiff Very Dark Brown Silty Clay; intermixed peat (Organic Matter Content = 7.0%)	5	S-02	3 4 4	8	28.4		2000*
		6.0		S-03	2 3 4	7	11.4		6000*
882.5		Very Stiff Brown Sandy Clay with trace silt and gravel	10	S-04	3 4 7	11	10.2		6000*
		13.5		S-05	4 4 4	8	11.9		3000*
877.5		Stiff Gray Sandy Clay with trace silt and gravel	15						
		18.5		S-06	5 6 6	12	12.4		3000*
872.5		Stiff Gray Clayey Silt 20.0	20						
		End of Boring @ 20 ft							
867.5			25						
862.5			30						

Total Depth: 20 ft
Drilling Date: December 1, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
15 feet during drilling operations; wet cave at 16-3/4 feet after auger removal

Notes:
Borehole collapsed at 17 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 28

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31862° Longitude: -83.89674°

Soil Boring No. B-29

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 881.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sandy Clay (7 inches) 0.6							
		Stiff Brown Sandy Clay with trace silt and gravel; occasional clayey sand layers		S-01	6 10 9	19	14.7		3000*
		3.0							
876.0		Loose to Medium Compact Brown Clayey Sand with trace silt and gravel; occasional cobbles	5	S-02	5 12 12	24			
				S-03	4 5 5	10			
		8.5							
871.0			10	S-04	6 14 14	28			
866.0		Medium Compact to Compact Brown Gravelly Sand with trace silt and clay	15	S-05	10 20 16	36			
861.0		20.0	20	S-06	12 17 17	34			
		End of Boring @ 20 ft							
856.0			25						
851.0			30						

Total Depth: 20 ft
Drilling Date: December 2, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
10 feet during drilling operations; wet cave at 14-3/4 feet after auger removal

Notes:
Borehole collapsed at 15 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 29

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31879° Longitude: -83.8970°

Soil Boring No. B-30

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 886.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Sand (6 inches) 0.5							
		Loose Brown Clayey Sand with trace silt and gravel		S-01	6 5 3	8			
		3.0							
881.0		Stiff Brown Sandy Clay with trace silt and gravel	5	S-02	4 4 3	7	12.2		2000*
		6.0		S-03	8 11 17	28			
876.0			10	S-04	12 19 21	40			
871.0		Medium Compact to Compact Brown Sand with trace silt and gravel	15	S-05	9 10 13	23			
		18.5							
866.0		Compact Brown Sandy Gravel with trace silt 20.0	20	S-06	10 25 12	37			
		End of Boring @ 20 ft							
861.0			25						
856.0			30						

Total Depth: 20 ft
Drilling Date: December 2, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
Dry during drilling operations; dry cave at 14 feet after auger removal

Notes:
Borehole collapsed at 14 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 30

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31904° Longitude: -83.89682°

Soil Boring No. B-31

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 892.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sandy Clay (2 inches) 0.2							
		Fill: Stiff Brown Sandy Clay with trace silt and gravel; occasional clayey sand layers		S-01	5 6 6	12	15.1		3000*
		3.0							
887.0		Medium Compact Brown Sandy Silt with trace gravel	5	S-02	5 7 8	15			
		6.0							
		Very Stiff Brown Silty Clay with trace sand and gravel		S-03	7 8 16	24	11.7		7000*
		8.5							
882.0		Compact Brown Gravelly Sand with trace silt	10	S-04	12 17 16	33			
		13.5		S-05	5 7 11	18			
877.0		Medium Compact Brown Clayey Sand with trace silt and gravel; occasional gravelly sand layers	15						
		20.0	20	S-06	2 6 9	15			
872.0		End of Boring @ 20 ft							
867.0			25						
862.0			30						

Total Depth: 20 ft
Drilling Date: December 3, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
19 feet during drilling operations; wet cave at 12 feet after auger removal

Notes:
Borehole collapsed at 12 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 31

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31915° Longitude: -83.89652°

Soil Boring No. B-32

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 891.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sandy Clay (4 inches) 0.3							
		Hard Brown Silty Clay with trace sand and gravel (LL = 21, PI = 6)		S-01	8 7 7	14	12.1		9000*
886.0		4.5	5	S-02	8 12 9	21			
		Medium Compact Brown Silty Sand with trace gravel 6.0							
		Hard Brown Sandy Clay with trace silt and gravel 8.0		S-03	8 8 10	18	10.0		9000*
881.0		Compact Brown Clayey Sand with trace silt and gravel 10.0	10	S-04	12 20 21	41			
		End of Boring @ 10 ft							
876.0			15						
871.0			20						
866.0			25						
861.0			30						

Total Depth: 10 ft
Drilling Date: December 2, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
Dry during drilling operations; dry cave at 9-1/2 feet after auger removal

Notes:
Borehole collapsed at 9-1/2 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 32

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31952° Longitude: -83.89623°

Soil Boring No. B-33

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 887.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Clayey Sand (7 inches) 0.6							
		Fill: Medium Compact Brown Clayey Sand with trace silt; occasional silty sand layers		S-01	7 8 7	15			
		3.0							
882.0		Very Stiff Brown Sandy Clay with trace silt and gravel; hydrocarbon odor	5	S-02	4 4 9	13	10.7		7000*
		6.0							
		Very Stiff Reddish Brown Sandy Clay with trace silt and gravel		S-03	2 4 5	9	19.1		5000*
		9.0							
877.0		Medium Compact Brown Sand with trace silt and gravel 10.0	10	S-04	1 7 10	17			
		End of Boring @ 10 ft							
872.0			15						
867.0			20						
862.0			25						
857.0			30						

Total Depth: 10 ft
Drilling Date: December 4, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
Dry during drilling operations; dry cave at 8-1/2 feet after auger removal

Notes:
Borehole collapsed at 8-1/2 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 33

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.31992° Longitude: -83.89621°

Soil Boring No. B-34

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 883.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Sandy Clay (6 inches) 0.5							
		Very Stiff Brown Sandy Clay with trace silt and gravel		S-01	4 4 3	7	16.9		5000*
		3.8							
878.0		Loose Brown Silty Sand with trace gravel	5	S-02	3 3 2	5			
		6.0							
		Medium Compact Brown Clayey Sand with trace silt and gravel		S-03	5 7 10	17			
873.0		10.0	10	S-04	8 12 10	22			
		End of Boring @ 10 ft							
868.0			15						
863.0			20						
858.0			25						
853.0			30						

Total Depth: 10 ft
Drilling Date: December 4, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
Dry during drilling operations; dry cave at 7-1/2 feet after auger removal

Notes:
Borehole collapsed at 7-1/2 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 34

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.32027° Longitude: -83.89586°

Soil Boring No. B-35

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

ELEV. (ft)	PRO-FILE	GROUND SURFACE ELEVATION: 865.0 ft	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Topsoil: Dark Brown Silty Sand (6 inches) 0.5							
		Medium Compact Brown Silty Sand with trace gravel		S-01	10 10 12	22			
		3.5							
860.0		Medium Brown Sandy Clay with trace silt and gravel	5	S-02	4 3 4	7	11.5		1500*
		6.0							
		Very Stiff Brown Silty Clay with trace sand and gravel		S-03	6 12 10	22	12.2		6000*
		8.5							
855.0		Stiff Brown Sandy Clay with trace silt and gravel 10.0	10	S-04	5 6 9	15	10.9		3000*
		End of Boring @ 10 ft							
850.0			15						
845.0			20						
840.0			25						
835.0			30						

Total Depth: 10 ft
Drilling Date: December 4, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
Dry during drilling operations; dry cave at 8-3/4 feet after auger removal

Notes:
Borehole collapsed at 9 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 35

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.32640° Longitude: -83.89043°

Soil Boring No. B-36

CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: N/A

- Crushed Limestone Aggregate: Gray Gravelly Sand with trace silt — 0.0 to 2.0
- Medium Compact Brown Silty Sand with trace gravel — 2.0 to 3.5
- Loose to Medium Compact Brown Sand with trace silt and gravel — 3.5 to 8.5
- Hard Gray Silty Clay with trace sand and gravel — 8.5 to 12.5
- Hard Gray Sandy Clay with trace silt and gravel (Hardpan) — 12.5 to 30.0

SOIL SAMPLE DATA

DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
0	S-01	8 6 7	13			
5	S-02	2 3 3	6			
5	S-03	9 10 13	23			
10	S-04	6 11 18	29	8.7		9000*
15	S-05	3 8 50/3"	---	7.8		9000*
20	S-06	14 50/5"	---	7.9		9000*
25	S-07	100/4"	---	11.0		
30	S-08	61 50/3"	---	8.3		9000*

Total Depth: 30 ft End of Boring @ 30 ft
Drilling Date: December 8, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
5 feet during drilling operations; wet cave at 15 feet after auger removal

Notes:
Borehole collapsed at 15 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 36

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.32583° Longitude: -83.89041°

Soil Boring No. B-37

CONSULTING GROUP

SUBSURFACE PROFILE

SOIL SAMPLE DATA

DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Crushed Limestone Aggregate: Gray Gravelly Sand with trace silt — 1.0							
		Fill: Loose Brown Silty Sand — 2.3		S-01	5 4 4	8			
5		Fill: Loose Very Dark Brown Silty Sand (Organic Matter Content = 6.5%) — 4.8	5	S-02	3 2 3	5			
				S-03	2 4 6	10			
10		Very Loose to Loose Brown Sand with trace silt and gravel	10	S-04	3 1 2	3			
		— 13.5		S-05	20 26 34	60	8.8		9000*
15			15						
		Hard Gray Silty Clay with trace sand and gravel; occasional cobbles		S-06	25 38 50/6"	---	7.7		9000*
20			20						
		— 22.5		S-07	25 44 50/2"	---	9.2		9000*
25		(Poor recovery @ S-07) Hard to Very Hard Gray Sandy Clay with trace silt and gravel (Hardpan)	25						
		— 30.0		S-08	31 50/5"	---	11.1		9000*
30			30						

Total Depth: 30 ft End of Boring @ 30 ft
Drilling Date: December 8, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
7 feet during drilling operations; wet cave at 6 feet after auger removal

Notes:
Borehole collapsed at 6 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 37

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/7/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.32643° Longitude: -83.88910°

Soil Boring No. B-38

CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: N/A

- 0.0 – 0.6: Topsoil: Dark Brown Silty Sand (7 inches)
- 0.6 – 3.0: Fill: Medium Compact Brown Sand with trace silt and gravel
- 3.0 – 6.0: Fill: Medium Compact Gray and Brown Silty Sand; occasional clay clods
- 6.0 – 30.0: Hard Gray Sandy Clay with trace gravel
  - (Poor recovery @ S-05)

SOIL SAMPLE DATA

DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
	S-01	6 6 8	14			
5	S-02	5 8 9	17			
	S-03	4 8 15	23	8.6		9000*
10	S-04	6 13 40	53	7.1		9000*
15	S-05	20 25 27	52			
20	S-06	17 26 32	58	8.8		9000*
25	S-07	21 20 33	53	7.2		
30	S-08	30 33 39	72	7.0		

Total Depth: 30 ft End of Boring @ 30 ft
Drilling Date: December 4, 2025
Inspector:
Contractor: 2G Drilling
Driller: A. Guzdzial

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

Water Level Observation:
5 feet during drilling operations; wet cave at 29 feet after auger removal

Notes:
Borehole collapsed at 29 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 38

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/9/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.32586° Longitude: -83.88908°

Soil Boring No. B-39

CONSULTING GROUP

SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: N/A

Loose Reddish Brown Silty Sand

6.5

Loose Brown Sand with trace silt

8.5

Very Stiff Brown Sandy Clay with trace silt and gravel

13.0

Hard to Very Hard Gray Sandy Clay with trace silt and gravel; occasional cobbles

SOIL SAMPLE DATA

DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
	S-01	5 4 3	7			
5	S-02	3 3 4	7			
	S-03	3 3 5	8			
10	S-04	9 14 16	30	12.9		4000*
15	S-05	13 26 35	61	9.6		9000*
20	S-06	27 33 36	69	8.5		9000*
25	S-07	55 50/5"	---	9.1		9000*
30	S-08	19 31 42	73	6.6		9000*

Total Depth: 35 ft
Drilling Date: December 8, 2025
Inspector:
Contractor: 2G Drilling
Driller: Brendan

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

Water Level Observation:
6-1/2 feet during drilling; dry cave at 11 feet after auger removal

Notes:
Borehole collapsed at 11 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 39a

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/9/26

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No. 253566

Latitude: 42.32586° Longitude: -83.88908°

Soil Boring No. B-39

CONSULTING GROUP

SUBSURFACE PROFILE				SOIL SAMPLE DATA					
DEPTH (ft)	PRO-FILE	GROUND SURFACE ELEVATION: N/A	DEPTH (ft)	SAMPLE TYPE-NO.	BLOWS/ 6-INCHES	STD. PEN. RESISTANCE (N)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP. STR. (PSF)
		Hard to Very Hard Gray Sandy Clay with trace silt and gravel; occasional cobbles *(continued)*							
35		34.5 Very Compact Gray Gravelly Sand with trace silt 35.0	35	S-09	9 27 50/3"	---	8.1		9000*
		End of Boring @ 35 ft							
40			40						
45			45						
50			50						
55			55						
60			60						

Total Depth: 35 ft
Drilling Date: December 8, 2025
Inspector:
Contractor: 2G Drilling
Driller: Brendan

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

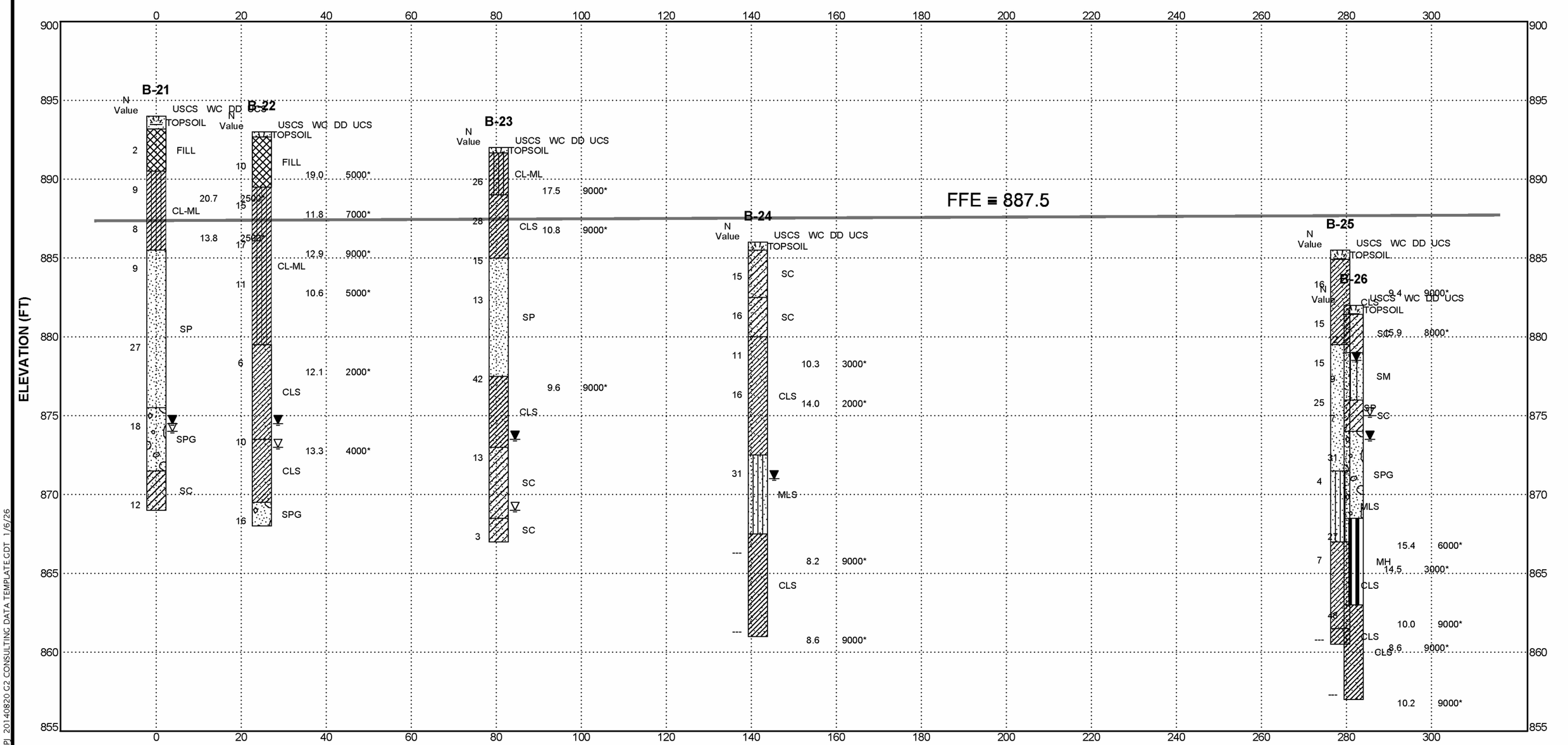
Water Level Observation:
6-1/2 feet during drilling; dry cave at 11 feet after auger removal

Notes:
Borehole collapsed at 11 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Borehole backfilled with auger cuttings

Figure No. 39b

SOIL / PAVEMENT BORING 253566.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 1/9/26



Legend

- ▽ Encountered Groundwater Level
- ▼ Groundwater Level at Completion

G2 CONSULTING GROUP

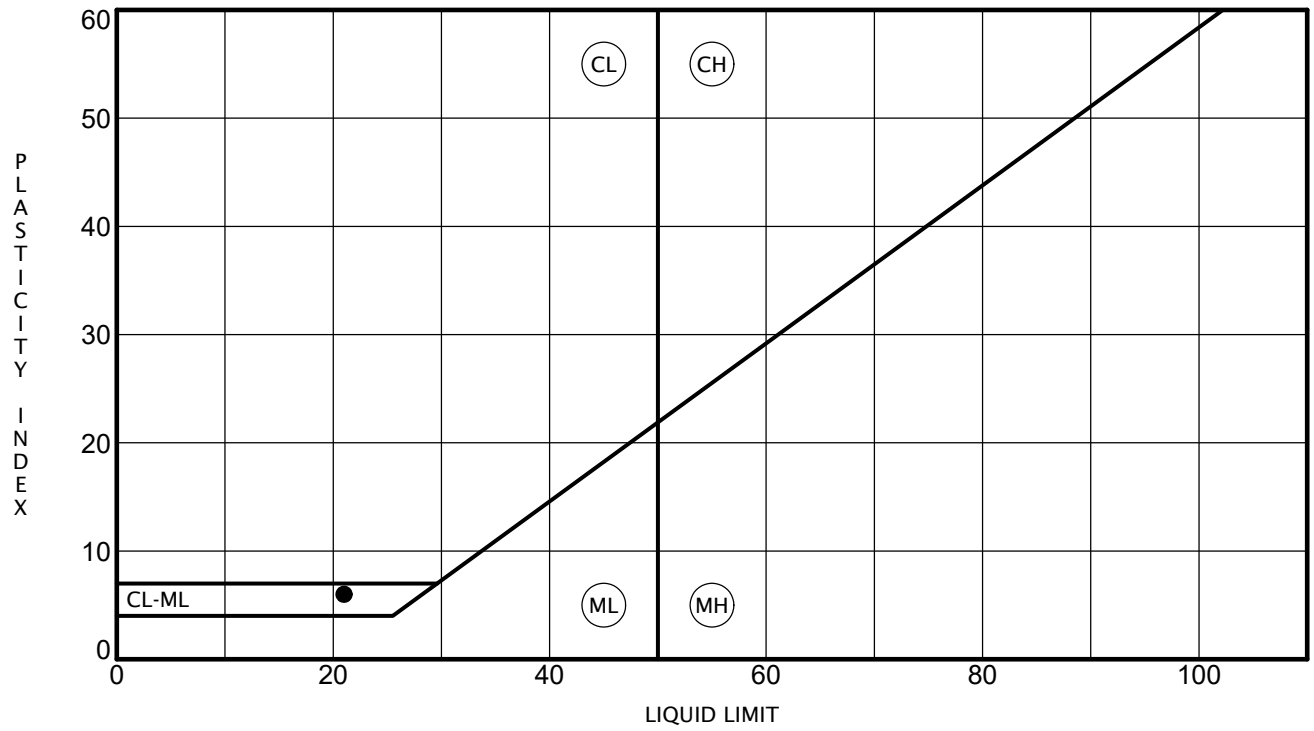
SOIL BORING PROFILE A-A'

Project Name: Dexter Schools 2025 Bond Program - Dexter
Project Location: Fieldhouse & Al Ritt Stadium Improvements
Dexter, Michigan

G2 Project No.: 253566

Figure No. 40

SOIL BORING PROFILE WITH WATER LEVELS 253566.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 1/6/26



	Specimen Identification		LL	PL	PI	Fines	M %	Classification
●	B-32	S-01	21	15	6		12	Brown Silty Clay

CONSULTING GROUP

ATTERBERG LIMITS RESULTS

Project Name: Dexter Schools 2025 Bond Program - Dexter Fieldhouse & Al Ritt Stadium Improvements

Project Location: Dexter, Michigan

G2 Project No.: 253566

Figure No. 41

US_ATTERBERG_LIMITS 253566.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 1/6/26

GENERAL NOTES TERMINOLOGY

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

PARTICLE SIZE

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

CLASSIFICATION

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

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

COHESIVE SOILS

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

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

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

COHESIONLESS SOILS

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

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

SAMPLE DESIGNATIONS

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

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