

Project Manual
for
Vystar Ballpark: Bullpen Relocation



for
Jacksonville
Jumbo Shrimp

301 A Philip Randolph Blvd,
Jacksonville, FL 32202
Project No. J20251137.000

For: Bid and Permit
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SECTION 01 10 00 - SUMMARY

PART 1 GENERAL

1.01 PROJECT

- A. The Project consists of the construction of _____.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 52 00 - Agreement Form.

1.03 DESCRIPTION OF WORK

- A. Scope of work as indicated on drawings.

1.04 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

END OF SECTION 01 10 00

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SECTION 01 20 00 - PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.

1.02 SCHEDULE OF VALUES

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Forms filled out by hand will not be accepted.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Forms filled out by hand will not be accepted.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment .

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Sustainable design action plans, including preliminary project materials cost data.
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.

1.04 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

- A. After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.'
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

1.05 APPLICATION FOR FINAL PAYMENT

- A. After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. All closeout procedures specified in Section 01 70 00.
 2. Evidence of completion of Project closeout requirements..

3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid..
4. Updated final statement, accounting for final changes to the Contract Sum..
5. AIA Document G706..
6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 20 00

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SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 01 23 00 - Alternates, for product alternatives affecting this section.
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.
- C. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, equipment, and methods of construction.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

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 coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
1. No specific form is required. Contractor's Substitution Request documentation must include the following:
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - 2) Owner's, Architect's, and Contractor's names.
 - b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - 8) Description of how proposed substitution affects other parts of work.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Warranties.
 - 6) Other salient features and requirements.
 - 7) Include, as appropriate or requested, the following types of documentation:
 - a) Product Data:
 - b) Samples.
 - c) Certificates, test, reports or similar qualification data.
 - d) Drawings, when required to show impact on adjacent construction elements.
 - d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- 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 QUALITY ASSURANCE

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

3.03 PROCEDURES

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

3.04 SUBSTITUTIONS

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

3.05 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.

3.06 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.

END OF SECTION 01 25 00

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SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.02 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

1.03 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect .
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.04 CONSTRUCTION CHANGE DIRECTIVE

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

1.05 WORK CHANGE DIRECTIVE

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 26 00

SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Digital project management procedures.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Contractor's reports.
- F. Photographic Documentation.
- G. Coordination drawings.
- H. Submittals for review, information, and project closeout.
- I. Requests for Information (RFI) procedures.
- J. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- B. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 3. Digital Drawing Software Program: Contract Drawings are available in AutoCad 2018.
 4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
 - a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
 5. The following digital data files will be furnished for each appropriate discipline:
 - a. Floor plans.
 - b. Reflected ceiling plans.
 - c. Sections
 - d. Interior Elevations.
- B. Web-Based Project Management Software Package: Use Architect's web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.
1. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.

3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

3.02 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
- B. Preconstruction Conference
 1. Schedule and conduct meeting before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement..
 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises and existing building.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for moisture and mold control.
 - u. Procedures for disruptions and shutdowns.
 - v.
 - w. Parking availability.
 - x. Office, work, and storage areas.
 - y. Equipment deliveries and priorities.
 - z. First aid.
 - aa. Security.
 - bb. Progress cleaning.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager, and Owner's Commissioning Authority of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Possible conflicts.
3. Other necessary identification.
4. Remarks.
5. Signature of transmitter.
 - a. Compatibility requirements.
 - b. Time schedules.
 - c. Weather limitations.
 - d. Manufacturer's written instructions.
 - e. Warranty requirements.
 - f. Compatibility of materials.
 - g. Acceptability of substrates.
 - h. Temporary facilities and controls.
 - i. Space and access limitations.
 - j. Regulations of authorities having jurisdiction.
 - k. Testing and inspecting requirements.
 - l. Installation procedures.
 - m. Coordination with other work.
 - n. Required performance results.
 - o. Protection of adjacent work.
 - p. Protection of construction and personnel.
6. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
7. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
8. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

3.03 PROGRESS MEETINGS

- A. Conduct progress meetings at weekly intervals.
- B. Coordinate dates of meetings with preparation of payment requests.

- C. Attendance Required:
 - 1. In addition to representatives of Owner, Owner's Commissioning Authority, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
- D. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - 1. Review minutes of previous meetings.
 - 2. Review of work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems that impede, or will impede, planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 7. Corrective measures to regain projected schedules.
 - 8. Planned progress during succeeding work period.
 - 9. Deliveries.
 - 10. Off-site fabrication.
 - 11. Access.
 - 12. Site use.
 - 13. Temporary facilities and controls.
 - 14. Progress cleaning.
 - 15. Maintenance of quality and work standards.
 - 16. Effect of proposed changes on progress schedule and coordination.
 - 17. Other business relating to work.
- E. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

3.04 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 - 1. Date.
 - 2. High and low temperatures, and general weather conditions.
 - 3. List of subcontractors at Project site.
 - 4. List of separate contractors at Project site.
 - 5. Approximate count of personnel at Project site.
 - 6. Major equipment at Project site.
 - 7. Material deliveries.
 - 8. Safety, environmental, or industrial relations incidents.
 - 9. Meetings and significant decisions.

10. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
14. Change Orders received and implemented.
15. Testing and/or inspections performed.
16. Services connected and disconnected.
17. Partial completions and occupancies.
18. Substantial Completions authorized.
19. Signature of Contractor's authorized representative.

- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

3.05 PHOTOGRAPHIC DOCUMENTATION

- A. Submit new photographs _____, within 3 days after being taken.
- B. Photography Type: Digital; electronic files.
1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
 2. Identification: Provide the following information with each image description in file metadata tag :
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction.
 3. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
 4. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 5. Metadata: Record accurate date and time from camera.
 6. File Names: Name media files with date Project area and sequential numbering suffix.
- C. Construction Photographs
1. General: Take photographs with maximum depth of field and in focus.
 - a. Maintain key plan with each set of construction photographs that identifies each photographic location.
 2. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect .
 - a. Flag construction limits before taking construction photographs.

- b. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
 - c. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - d. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
3. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
 - a. Underground utilities.
 - b. Underslab services.
 - c. Piping.
 - d. Electrical conduit.
 - e. Waterproofing and weather-resistant barriers.
4. Final Completion Construction Photographs: Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

3.06 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
 1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
7. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format .
8. Architect will furnish upon Contractor's request one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in AutoCad 2018 DWG Format .
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

3.07 REQUESTS FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Owner's, Architect's, and Contractor's names.
 3. RFI number, numbered sequentially.
 4. RFI subject.
 5. Issue date, and requested reply date.
 6. 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).
 7. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 8. 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.

- C. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software. Software log with not less than the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect and Construction Manager.
 - 4. RFI number including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's and Construction Manager's response was received.
- E. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within three days if Contractor disagrees with response.
- F. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow three days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.
 - 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect or Construction Manager of additional information.
 - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within five days of receipt of the RFI response.

3.08 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

3.09 SUBMITTALS FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Architect.
 - 4. Name of Contractor.
 - 5. Name of firm or entity that prepared submittal.
 - 6. Names of subcontractor, manufacturer, and supplier.
 - 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 - 8. Category and type of submittal.
 - 9. Submittal purpose and description.
 - 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 - 11. Drawing number and detail references, as appropriate.
 - 12. Indication of full or partial submittal.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Submittals for Utilizing Web-Based Project Management Software: Prepare submittals as PDF files, or other format indicated by Project management software.

3.10 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.

3.11 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 78 00 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.12 SUBMITTAL PROCEDURES

- A. General Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Resubmittal Review: Allow 15 days for review of each resubmittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.
- G. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:

- a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- H. Shop Drawing Procedures:
1. Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 2. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
- I. Samples Procedures: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

- b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- J. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.
- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- L. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- M. Certificates:
 - 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 - 2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 - 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 - 4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

3.13 SUBMITTAL REVIEW

A. Contractor's Review

1. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
2. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp . Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - a. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

B. Architect's Review

1. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
 - a. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.
2. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
3. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
4. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
5. Architect will return without review submittals received from sources other than Contractor.
6. Submittals not required by the Contract Documents will be returned by Architect without action.

END OF SECTION 01 30 00

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SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Contractor's Construction Schedule.

1.02 RELATED SECTIONS

- A. Section 01 10 00 - Summary: Work sequence.

1.03 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time belongs to Owner.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.04 SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

- C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports to contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 - 3. Total Float Report: List of activities sorted in ascending order of total float.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.
- E. Daily Construction Reports: Submit at weekly intervals.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Use Microsoft Project, Scheduling component of Project management software package specified in Section 013100 "Project Management and Coordination," for current Windows operating system.
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 - 1. Contract completion date to not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Commissioning Time: Include no fewer than 15 days for commissioning.
 - 6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected
 1. Phasing: Arrange list of activities on schedule by phase.
 2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 3. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and the Contract Time.
- G. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- H. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- I. Distribution: Distribute copies of approved schedule to Architect , Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.02 GANTT-CHART SCHEDULE REQUIREMENTS

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

END OF SECTION 01 32 16

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance.
- B. Testing and inspection agencies and services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements..
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Control of installation.
- D. Manufacturers' field services.
- E. Repair and Protection.

1.02 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
 - 1. Mockups are used for one or more of the following:
 - a. Verify selections made under Sample submittals.
 - b. Demonstrate aesthetic effects.
 - c. Demonstrate the qualities of products and workmanship.
 - d. Demonstrate successful installation of interfaces between components and systems.
 - e. Perform preconstruction testing to determine system performance.

- 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
- 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.

1.03 CONFLICTING REQUIREMENTS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.04 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Statement on condition of substrates and their acceptability for installation of product.
 - 2. Statement that products at Project site comply with requirements.
 - 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 5. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - 1. Statement that equipment complies with requirements.
 - 2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 3. Other required items indicated in individual Specification Sections.

1.05 Quality Assurance

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

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

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups of size indicated.
 2. Build mockups in location indicated or, if not indicated, as directed by Architect or Construction Manager.
 3. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
 4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 6. Obtain Architect's and Construction Manager's approval of mockups before starting corresponding work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.06 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 6. Security and protection for samples and for testing and inspection equipment at Project site.

- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.07 Testing and Inspection Agencies and Services

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 6. Retesting and reinspecting corrected Work.

PART 3 EXECUTION

2.01 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.

2.02 TESTING AND INSPECTION

- A. 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.
- B. 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.
- C. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- D. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and Construction Manager's and authorities' having jurisdiction reference during normal working hours.
 - 1. Submit log at Project closeout as part of Project Record Documents.
- E. 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 and to manufacturers' facilities.
 - 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 24 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.

- F. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- G. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

2.03 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, and _____ 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.

2.04 REPAIR AND PROTECTION

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- C. Protect construction exposed by or for quality-control service activities.
- D. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

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SECTION 01 42 19 - REFERENCES

PART 1 GENERAL

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

1.02 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
 - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.03 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
 - 1. DIN - Deutsches Institut für Normung e.V.; www.din.de.
 - 2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.

3. ICC - International Code Council; www.iccsafe.org.
 4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.
- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
1. CPSC - U.S. Consumer Product Safety Commission; www.cpsc.gov.
 2. DOC - U.S. Department of Commerce; www.commerce.gov.
 3. DOD - U.S. Department of Defense; www.defense.gov.
 4. DOE - U.S. Department of Energy; www.energy.gov.
 5. DOJ - U.S. Department of Justice; www.ojp.usdoj.gov.
 6. DOS - U.S. Department of State; www.state.gov.
 7. EPA - United States Environmental Protection Agency; www.epa.gov.
 8. FAA - Federal Aviation Administration; www.faa.gov.
 9. GPO - U.S. Government Publishing Office; www.gpo.gov.
 10. GSA - U.S. General Services Administration; www.gsa.gov.
 11. HUD - U.S. Department of Housing and Urban Development; www.hud.gov.
 12. LBNL - Lawrence Berkeley National Laboratory; Energy Technologies Area; www.lbl.gov/.
 13. NIST - National Institute of Standards and Technology; www.nist.gov.
 14. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 15. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
 16. USACE - U.S. Army Corps of Engineers; www.usace.army.mil.
 17. USDA - U.S. Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
 18. USDA - U.S. Department of Agriculture; Rural Utilities Service; www.usda.gov.
 19. USP - U.S. Pharmacopeial Convention; www.usp.org.
 20. USPS - United States Postal Service; www.usps.com.
- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from U.S. Government Publishing Office; www.govinfo.gov.
 2. DOD - U.S. Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.
 3. DSCC - Defense Supply Center Columbus; (see FS).
 4. FED-STD - Federal Standard; (see FS).
 5. FS - Federal Specification; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from U.S. General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.
 6. MILSPEC - Military Specification and Standards; (see DOD).
 7. USAB - United States Access Board; www.access-board.gov.

8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (see USAB).
- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. BEARHFTI; California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; (see BHGS).
 2. BHGS; State of California Bureau of Household Goods and Services; (Formerly: California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation); www.bhgs.dca.ca.gov.
 3. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.oal.ca.gov/publications/ccr/.
 4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cdph.ca.gov/Programs/CCDCPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx.
 5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
 6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
 7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; <https://tfswb.tamu.edu/>.

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUMMARY

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

1.02 RELATED REQUIREMENTS

- A. Section 011000 "Summary"

1.03 USE CHARGES

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

1.04 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.

2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

1.05 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1.

1.06 PROJECT CONDITIONS

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

PART 2 PRODUCTS

2.01 TEMPORARY FACILITIES

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

2.02 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 EXECUTION

3.01 TEMPORARY FACILITIES, GENERAL

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

3.02 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

3.03 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity unless owner authorizes use of permanent HVAC. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead unless otherwise indicated.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.04 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 - 1. Utilize designated area within existing building for temporary field offices.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- D. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs so they are legible at all times.

F. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

F. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

H. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.

2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.

3. Provide walk-off mats at each entrance through temporary partition.

- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.06 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard and replace stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.07 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 01 50 00

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SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Comparable Products
- D. Substitution limitations.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluating Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 2. Data indicating compliance with the requirements specified in "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.04 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.

1.05 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.07 PRODUCT WARRANTIES

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

PART 2 PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
 - 1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

- a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
 3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
 4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
 5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
 6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
 7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

2.02 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 1. Architect's Approval of Submittal: Indication of approval in web-based Project management software . See Section 013300 "Submittal Procedures."
 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

2.03 MAINTENANCE MATERIALS

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

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 25 00 - Substitution Procedures.

3.02 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. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.
- 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. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 60 00

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SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Surveying for laying out the work.
- E. Field Engineering
- F. Cleaning and protection.
- G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- H. Correction of the Work.
- I. Coordination of Owner's portion of the Work.
- J. Substantial Completion procedures.
- K. Final Completion procedures.
- L. List of incomplete items.
- M. Submittal of Project warranties.
- N. Final cleaning.
- O. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- E. Section 02 41 00 - Selective Demolition: Demolition of whole structures and parts thereof; site utility demolition.

1.03 DEFINITIONS

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

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. 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.
 - f. Written permission of affected separate Contractor.
 - g. Date and time work will be executed.
 - h. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - 1) Include description of provisions for temporary services and systems during interruption of permanent services and systems.
 - i. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Product Data: For each type of cleaning agent.
- E. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- F. Certified List of Incomplete Items: Final submittal at Final Completion.
- G. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 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,
- B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. Operating systems of special construction.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

- a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

1.07 PROJECT CONDITIONS

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.08 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.

1.09 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 5. Submit testing, adjusting, and balancing records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1.10 FINAL COMPLETION PROCEDURES

- A. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.11 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, , listed by room or space number.
 - 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - 4. Project name.
 - 5. Date.
 - 6. Name of Architect and Construction Manager.
 - 7. Name of Contractor.
 - 8. Page number.
 - 9. Submit list of incomplete items in the following format:
 - 10. PDF Electronic File: Architect , through Construction Manager, will return annotated file.
 - 11. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

PART 2 PRODUCTS

2.01 MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.
- D. Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- E. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- F. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

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 four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 1. Review conditions of examination, preparation and installation procedures.
 2. Review coordination with related work.

- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
- F. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- G. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- H. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- I. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through Construction Manager in accordance with requirements in Section 013100 "Project Management and Coordination."

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Engage a professional engineer experienced in laying out the Work, using the following accepted surveying practices:
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Promptly notify Architect of any discrepancies discovered.
- 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.
- 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. 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.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.
- F. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- G. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- H. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- I. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- J. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- K. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- L. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- M. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.06 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-complying 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: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- 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 84 00, to full thickness of the penetrated element.
- I. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. 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.
 - 4. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 - 5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

3.07 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.

3.08 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.

3.09 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

3.10 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."
- F. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

- A. Execute final cleaning prior to Substantial Completion.
- B. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
- C. Use cleaning materials that are nonhazardous.
- D. 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.
- E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- G. Clean filters of operating equipment.
- H. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and _____.
- I. Clean site; sweep paved areas, rake clean landscaped surfaces.
- J. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- K. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

3.12 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Accompany Project Coordinator 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.

3.13 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 70 00

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.
- E. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: List of items to be salvaged from the existing building for relocation in project or for Owner.
- B. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- C. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- D. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- E. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Submit Waste Management Plan within 7 after receipt of Notice to Proceed, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total nonhazardous solid waste generated by the Work. Facilitate recycling and salvage of materials.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.

2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

3.03 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
- 1.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Do not burn waste materials.

END OF SECTION 01 74 19

SECTION 01 78 00 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.
- B. Operation and maintenance data.
- C. Emergency manuals.
- D. Systems and equipment operation manuals.
- E. Systems and equipment maintenance manuals.
- F. Product maintenance manuals.
- G. Warranties.

1.02 RELATED REQUIREMENTS

- A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
 - 3) Submit Record Digital Data Files and one set(s) of plots.
 - 4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit three paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.

- 3) Print each drawing, whether or not changes and additional information were recorded.
- C. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- D. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual
- E. Operation and Maintenance Data:
 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- F. Format: Submit operation and maintenance manuals in the following format:
 1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.
- G. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- H. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.
- I. Submittal of Project Warranties:
 1. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
 2. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 3. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - a. Submit by uploading to web-based project software site .

PART 3 EXECUTION

2.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 1. Drawings.
 2. Addenda.
 3. Change Orders and other modifications to the Contract.

- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Drawings and Shop Drawings: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - 1. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - 2. Accurately record information in an acceptable drawing technique.
 - 3. Record data as soon as possible after obtaining it.
 - 4. Record and check the markup before enclosing concealed installations.
 - 5. Cross-reference record prints to corresponding photographic documentation.
 - 6. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Field changes of dimension and detail.
 - b. Details not on original Contract drawings.
 - c. Dimensional changes to Drawings.
 - d. Revisions to details shown on Drawings.
 - e. Depths of foundations.
 - f. Locations and depths of underground utilities.
 - g. Revisions to routing of piping and conduits.
 - h. Revisions to electrical circuitry.
 - i. Actual equipment locations.
 - j. Duct size and routing.
 - k. Locations of concealed internal utilities.
 - l. Changes made by Change Order or Construction Change Directive.
 - m. Changes made following Architect's written orders.
 - n. Details not on the original Contract Drawings.
 - o. Field records for variable and concealed conditions.
 - p. Record information on the Work that is shown only schematically.
 - 7. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 8. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 9. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 10. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- F. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 - 1. Format: Annotated PDF electronic file with comment function enabled.
 - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 3. Refer instances of uncertainty to Architect for resolution.

4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
- G. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.
- H. Record Specifications: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders , Record Product Data, and Record Drawings where applicable.
 6. Format: Submit record specifications as annotated PDF electronic file .
- I. Record Product Data: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders , Record Specifications, and Record Drawings where applicable.
 4. Format: Submit Record Product Data as annotated PDF electronic file.
 - a. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.
- J. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

2.02 OPERATION AND MAINTENANCE DATA

- A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- B. 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.
- C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- D. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

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

2.04 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. 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.
- E. 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.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- L. Include test and balancing reports.
- M. Additional Requirements: As specified in individual product specification sections.

2.05 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Name and contact information for Commissioning Authority.
 - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.

10. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.06 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties
- E. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.07 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

2.08 WARRANTIES

- 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 (216 by 279 mm) 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 78 00

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SECTION 02 41 00 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of built site elements.
- B. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

- A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.03 REFERENCE STANDARDS

PART 3 EXECUTION

2.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. 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.
 - 3. Provide, erect, and maintain temporary barriers and security devices.
 - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 - 6. 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.
 - 7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Protect existing structures and other elements to remain in place and not removed.

1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

2.02 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 1. Verify 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. Remove existing work as indicated and required to accomplish new work.
 1. Remove items indicated on drawings.
- C. 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 to remain in operation, and 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.
- D. Protect existing work to remain.
 1. Prevent movement of structure. Provide shoring and bracing as required.
 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
 4. Patch to match new work.

2.03 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 41 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 Section Includes

- A. Concrete formwork.
- B. Concrete building frame members.
- C. Concrete for composite floor construction.
- D. Elevated concrete slabs.
- E. Floors and slabs on grade.
- F. Concrete shear walls, elevator shaft walls, and foundation walls.
- G. Concrete foundations and anchor bolts for pre-engineered building.
- H. Concrete reinforcement.
- I. Joint devices associated with concrete work.
- J. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks, and manholes.
- K. Concrete curing.

1.02 Related Requirements

- A. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 Reference Standards

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.
- D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- E. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- F. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.
- G. ACI PRC-308 - Guide to External Curing of Concrete; 2016.

- H. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- I. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- J. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.
- L. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.
- M. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2022.
- N. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2025.
- O. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- P. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- Q. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.
- R. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2024.
- S. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2024.
- T. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- U. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- V. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2024a.
- W. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.
- X. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.
- Y. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2023.
- Z. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.
- AA. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements; 2021.
- BB. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.
- CC. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2024.

- DD. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.
- EE. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars; 2025.
- FF. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2023.
- GG. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.
- HH. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- II. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.
- JJ. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2021.
- KK. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.04 Submittals

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
 - 2. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.
 - 3. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.
- D. Test Reports: Submit report for each test or series of tests specified.
- E. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

1.05 Quality Assurance

- A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
- B. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

PART 2 PRODUCTS

2.01 Formwork

- A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117. Formwork for exposed finishes to be able meet finish requirements.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 - 2. Form Facing for Exposed Finish Concrete: Steel.
 - 3. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - 4. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 5. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

2.02 Reinforcement Materials

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
 - 3. Finish: Epoxy coated in accordance with ASTM A775/A775M, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
 - 2. WWR Style: As indicated on drawings.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.
 - 4. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.

2.03 Concrete Materials

- A. Cement: ASTM C150/C150M, Type IL Portland type.
- B. Blended Hydraulic Cement: ASTM C595/C595M, Type IS(20).
- C. Fine and Coarse Aggregates: ASTM C33/C33M.
- D. Lightweight Aggregate: ASTM C330/C330M.

- E. Fly Ash: ASTM C618, Class C or F.
- F. Ground Granulated Blast Furnace Slag: ASTM C989/C989M.
- G. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 Admixtures

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

2.05 Bonding and Jointing Products

- A. Epoxy Bonding System:
- B. Waterstops: Bentonite and butyl rubber.
- C. Waterstops: Synthetic rubber; swells to 1000 percent of original size in clean water.
- D. Slab Isolation Joint Filler: 1/2-inch (13 mm) thick, height equal to slab thickness, with removable top section forming 1/2-inch (13 mm) deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.

2.06 Curing Materials

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
- C. Curing Agent, Water-Cure Equivalent Type: Clear, water-based, non-film-forming, liquid-water cure replacement agent.
 - 1. Comply with ASTM C309 standards for water retention.
 - 2. Compressive Strength of Treated Concrete: Equal to or greater than strength after 14-day water cure when tested in accordance with ASTM C39/C39M.
 - 3. VOC Content: Zero.

2.07 Concrete Mix Design

- A. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- B. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Cement Content: Minimum 450 pounds per cubic yard (___ kg per cu m).
 - 4. Water-Cement Ratio: Maximum 45 percent by weight.
 - 5. Total Air Content: 5-7 percent, determined in accordance with ASTM C173/C173M.
 - 6. Maximum Slump: 4 inches (100 mm).
 - 7. Maximum Aggregate Size: 5/8 inch (16 mm).

2.08 Mixing

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
 - 1. Colored Concrete: Add pigments in strict accordance with manufacturer's instructions to achieve consistent color from batch to batch.
 - 2. Fiber Reinforcement: Batch and mix as recommended by manufacturer for specific project conditions.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 Examination

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

3.02 Preparation

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Prepare existing concrete surfaces to be repaired according to ICRI 310.2R, ____.
- E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in accordance with bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

3.03 Installing Reinforcement and Other Embedded Items

- A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.
- B. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- C. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.04 Placing Concrete

- A. Place concrete in accordance with ACI PRC-304.
- B. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- D. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- E. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 Floor Flatness and Levelness Tolerances

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch (6 mm) in 10 feet (3 m).
- B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
 - 1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
 - 2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
 - 3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
 - 4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 Concrete Finishing

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/8 inch (___ mm) or more in height. Provide finish as follows:
 - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- C. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:

1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI PRC-302.1; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
 2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 3. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.
- D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.07 Curing and Protection

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 1. Normal concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

3.08 Field Quality Control

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards (76 cu m) or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.09 Defective Concrete

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

END OF SECTION 03 30 00

SECTION 04 20 00 - UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block and Insulated Concrete block
- B. Exterior wall copings.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Lintels.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.
- B. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).
- D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- F. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.
- G. ASTM C129 - Standard Specification for Dry-Cast Nonloadbearing Concrete Masonry Units; 2025.
- H. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2025.
- I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2025.

- J. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- K. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025a.
- L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- M. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- N. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2025a.
- O. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.
- P. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- Q. 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 at Project Site.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
 - 2. Special Shapes: Provide configured for corners, lintels, headers, control joint edges, jambs, sashes, and other detailed conditions.
 - 3. Load-Bearing Units: ASTM C90, normal weight.
 - a. Both hollow and solid block, as indicated.
 - b. Exposed Faces: Manufacturer's standard color and texture.
 - c. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of value indicated on drawings
 - d. Pattern: Running Bond..
- C. Exterior Wall Copings
 - 1. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
 - 2. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 - 3. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
 - 4. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet (6 meters).
 - 5. Color: Selected by Architect from manufacturer's full range. Remove cement film from exposed surfaces before packaging for shipment.
 - 6. Remove cement film from exposed surfaces before packaging for shipment.
 - 7. Shapes: Provide shapes indicated on drawings.
- D. Concrete Block: Standard Units with Foamed in Place Insulation: ASTM C90, normal weight.
 - 1. Insulation Type: Foamed in place masonry wall insulation.
 - a. Basis of Design: Corefill 500 as manufactured by Tailored Chemical Products, P.O. Box 4186, Hickory, NC 28603, 800 627-1687
 - 2. Pattern: Running Bond.
 - 3. Exposed exterior Faces, Color and Texture: To be painted in the field..

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- B. Mortar Aggregate: ASTM C144.
- C. Grout Aggregate: ASTM C404.
- D. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

- E. Water: Clean and potable.
- F. Packaged Dry Material for Mortar for Unit Masonry: 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.
 - 1. Color: Standard gray.
- G. 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.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Hohmann & Barnard, Inc; X-Seal Anchor: www.h-b.com/#sle.
 - 2. WIRE-BOND: www.wirebond.com/#sle.
 - 3. Approved equal..
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa), deformed billet bars; uncoated.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Truss or ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 - 3. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.
- E. Strap Anchors: Bent steel shapes, 1-1/2 inch (38 mm) width, 0.105 inch (2.7 mm) thick, 24 inch (610 mm) length, with 1-1/2 inch (38 mm) long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.
- F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face.

2.04 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
- C. Nailing Strips: Softwood lumber, preservative treated; as specified in Section 06 10 00.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.05 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 S.
 - 4. Interior, loadbearing masonry: Type S.
 - 5. Interior, non-loadbearing masonry: Type S.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).
- C. 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 related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

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. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners, except for units laid in stack bond.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL and SINGLE WYTHE MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch (16 mm) mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches (150 mm).
- F. Reinforce joint corners and intersections with strap anchors 16 inches (400 mm) on center.
- G. 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 36 inches (900 mm) horizontally and 24 inches (600 mm) vertically.

3.07 LINTELS

- A. Install specified lintels over openings.
- B. Maintain minimum 8 inch (____ mm) bearing on each side of opening.

3.08 GROUTED COMPONENTS

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.

3.09 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.
- C. Size control joints as indicated on drawings; if not indicated, 5/8" inch (____ mm) wide and deep.

3.10 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames 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 (300 mm) from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.11 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.
- D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

3.12 CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.13 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.14 CLEANING

- A. Replace defective mortar. Match adjacent work.
- B. Clean soiled surfaces with cleaning solution.

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 20 00

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Free-standing railings at exterior ramp and stair.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 09 91 13 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- D. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- E. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.
- F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2024.
- G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- H. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- J. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).
- K. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017, with Amendment (2021).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, height and length dimensions, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
 - 3. Include
- C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.
- D. Delegated Designer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified within previous in accordance with the following.
 - 1. AWS D1.1/D1.1M
 - 2. AWS D1.2/D1.2M
 - 3. AWS D1.6/D1.6M

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 RAILINGS - GENERAL REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- C. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

- D. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
- E. Comply with ASTM E985.
- F. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 50 pounds per linear foot (730 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- G. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- H. Allow for expansion and contraction of members and building movement without damage to connections or members.
- I. Dimensions: See drawings for configurations and heights.
- J. Provide inserts and other anchorage devices for connecting railings to concrete
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.
- K. Provide Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for exterior applications.
- L. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- M. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

- A. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, galvanized finish.
- B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- C. Exposed Fasteners: No exposed bolts or screws.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured.
- D. Welded Joints:

1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.
- C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Anchoring Posts:
 1. 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.
 2. Form or core-drill holes to depth required by deligated design and not less than 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
 3. Leave anchorage joint exposed with 1/8-inch (3-mm) buildup, sloped away from post.

END OF SECTION 05 52 13

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.01 Section Includes

- A. Structural dimension lumber framing.
- B. Nonstructural dimension lumber framing.
- C. Rough opening framing for doors, windows, and roof openings.
- D. Sheathing.
- E. Preservative treated wood materials.
- F. Miscellaneous framing and sheathing.
- G. Concealed wood blocking, nailers, and supports.
- H. Miscellaneous wood nailers, furring, and grounds.

1.02 Related Requirements

- A. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in masonry.
- B. Section 05 12 00 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.
- C. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
- D. Section 06 12 19 - Structural Insulated Panels.
- E. Section 06 13 23 - Heavy Timber Framing.
- F. Section 06 13 26 - Heavy Timber Trusses.
- G. Section 06 15 00 - Wood Decking.
- H. Section 06 17 53 - Shop-Fabricated Wood Trusses.
- I. Section 06 18 00 - Glued-Laminated Construction.
- J. Section 31 31 16 - Termite Control: Field-applied termiticide and mildewcide for wood materials.

1.03 Reference Standards

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.

- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- D. ASTM A924/A924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process; 2022a.
- E. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- G. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.
- H. AWWA M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products; 2023.
- I. AWWA U1 - Use Category System: User Specification for Treated Wood; 2025.
- J. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. ITS (DIR) - Directory of Listed Products; Current Edition.
- L. NELMA (SGR) - Standard Grading Rules for Northeastern Lumber; 2024.
- M. PS 1 - Structural Plywood; 2023.
- N. PS 20 - American Softwood Lumber Standard; 2025.
- O. SPIB (GR) - Standard Grading Rules; 2021.
- P. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 Submittals

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide technical data on application instructions.
- C. Product Data: Submit technical data on wood treatment.

1.05 Delivery, Storage, and Handling

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 General Requirements

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 Dimension Lumber For Concealed Applications

- A. Grading Agency: Northeastern Lumber Manufacturers Association; NELMA (SGR).
- B. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- C. Sizes: Nominal sizes as indicated on drawings, S4S.
- D. Moisture Content: S-dry or MC19.
- E. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)):
 - 1. Grade: No. 2.
- F. Rafter Framing (2 by 6 through 4 by 16 (50 by 150 mm through 100 by 400 mm)):
 - 1. Species and Grades: As indicated on drawings for various locations.
- G. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, as indicated on drawings..
 - 2. Boards: as indicated on drawings.

2.03 Construction Panels

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

2.04 Fire-Retardant Treatment (FRT)

- A. Products:
 - 1. Hoover Treated Wood Products, Inc: www.frtw.com/#sle.
- B. Factory-treat wood members in accordance with AWWA U1 and use category indicated.
- C. Kiln-dry after treatment (KDAT) to maximum moisture content of 19 percent for sawn material and 15 percent for plywood.

- D. Fabrication of FRT Wood:
 - 1. Ripping or milling of boards, lumber, and timber after treatment is not permitted.
 - 2. Field cutting to length and drilling of holes in boards, lumber, and timber are permitted without additional treatment.
 - 3. Field cutting and drilling of holes in plywood are permitted.
- E. Label or brand FRT wood with classification mark of UL (DIR) or ITS (DIR) or other approved inspection agency, the treatment plant, name of treatment, species of wood, flame spread and smoke developed index, method of drying after treatment, and treating standard.

2.05 Pressure-Preservative Treatment (PPT)

- A. Factory-treat wood members in accordance with AWPA U1 and use category indicated.
- B. Applications Indicated on Drawings: Use Category UC2, above ground, interior, damp.
- C. Kiln-dry wood after treatment with waterborne preservative to maximum moisture content of 19 percent for lumber and 15 percent for plywood.
- D. Fabricate to maximum extent possible before treatment.
- E. Label preservative-treated wood with marking as required by AWPA U1 and ICC (IBC). Unless otherwise permitted by standard U1 and building code, include the following markings: AWPA U1, accredited inspection agency mark, treating plant identification, type of preservative, preservative retention, and permitted end use.
- F. Field Treatment for Cuts and Holes in Preservative-Treated Wood: Comply with AWPA M4.

2.06 Accessories

- A. Metal and Finish of Fasteners:
 - 1. Fire-Retardant-Treated Wood:
 - a. Nails, timber rivets, wood screws, and lag screws: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
 - 2. Preservative-Treated Wood:
 - a. Nails, timber rivets, wood screws, and lag screws - general use: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
 - 3. Untreated Wood: Unfinished steel.
- B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
 - 1. For contact with preservative treated wood in exposed locations, provide minimum G185 (Z550) galvanizing complying with ASTM A653/A653M.
- C. Subfloor Adhesives: Gap-filling construction adhesive for bonding wood structural panels to wood-based floor system framing; complying with ASTM D3498.

PART 3 EXECUTION

3.01 Preparation

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches (100 mm) and seal.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- C. Coordinate installation of rough carpentry members specified in other sections.

3.02 Installation - General

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 Framing Installation

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches (38 mm) of bearing at each end.
- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- G. Provide bridging at joists in excess of 8 feet (2.3 m) span as detailed. Fit solid blocking at ends of members.
- H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 Blocking, Nailers, and Supports

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.05 Roof-Related Carpentry

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at each roof opening except where specifically indicated otherwise; form corners by alternating lapping side members.

3.06 Installation of Construction Panels

- A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.
- B. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. At long edges use sheathing clips where joints occur between roof framing members.
 - 2. Nail panels to framing; staples are not permitted.

3.07 Tolerances

- A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet (1 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.
- C. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.08 Field Quality Control

- A. See Section 01 40 00 - Quality Requirements for additional requirements.

END OF SECTION 06 10 00

SECTION 07 14 00 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 1.1 SECTION INCLUDES:

- A. Installation of waterproofing membrane on surfaces indicated on drawings, consisting of preparation of existing and repaired concrete surfaces, sealing of cracks and joints, and application of Reinforced Liquid-Applied Waterproofing Membrane.

1.02 1.2 RELATED SECTIONS

- A. B. Section 03300 - Cast-In-Place Concrete.
- B. C. Section 07900 - Joint Sealants.

1.03 1.3 REFERENCES

- A. ASTM C 836 100% Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for use with Separate Wearing Course.

1.04 1.4 SYSTEM DESCRIPTION

- A. Product provided by this Section is a coal-tar and solvent-free, single component, elastomeric liquid designed to create a seamless reinforced waterproofing membrane at 120 mil thickness.

1.05 1.5 ACTION SUBMITTALS

- A. A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and tested physical performance properties of waterproofing system.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. B. Shop Drawings:
 - 1. Show locations and extent of waterproofing.
 - 2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- C. D. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.7.

1.06 1.6 INFORMATION SUBMITTALS

- A. A. Qualification Data: For Installer.
- B. B. Field quality – control reports.

- C. C. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.8.
 - 1. 1.7 QUALITY ASSURANCE
- D. A. Applicator Qualifications: Applicator shall be experienced in applying the same or similar materials and shall be specifically approved in writing by the membrane system manufacturer.
- E. B. Pre-Application Conference: Prior to beginning work, convene a conference to review conditions, installation procedures, schedules and coordination with other work.
- F. C. Mockups: Build mockups to verify information shown and selections made under Sample submittals and to set quality standards for installation.
 - 1. Build in place mockup. Mockup to include all installation accessories and details to demonstrate surface preparation, crack and joint treatments, rebar penetrations, wall and footing treatments, pipe and penetration flashing, inside and outside corner treatment, and system protection.
 - 2. Size and location of Mockup: As indicated on Drawings.
 - 3. Approval of mockup 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 mockup may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 1.8 WARRANTY

- A. Upon completion and acceptance of the work required by this section, the manufacturer will issue a 5 year Material Warranty agreeing to promptly replace defective materials.

1.08 1.9 DELIVERY, STORAGE, AND HANDLING

- A. A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.
 - 1. 1. Name of material.
 - 2. 2. Manufacturer's stock number and date of manufacture.
 - 3. 3. Material safety data sheet.
- B. B. Recommended storage and application temperature is 75 degrees F. Store materials in protected and well ventilated area.

1.09 1.10 PROJECT CONDITIONS

- A. A. Do not apply membrane if temperature is less than 40 degrees F., if precipitation is imminent or the surface is wet or has frost. Substrate may be saturated surface dry.
- B. B. Coordinate waterproofing work with other trades to ensure adequate illumination, ventilation, and dust-free environment during application and curing of membrane. The applicator shall have sole right of access to the specified areas for the time needed to complete the application and allow the membrane to cure adequately.
- C. C. Protect adjoining surfaces not to be coated against damage or soiling. Protect plants, vegetation and animals which might be affected by waterproofing operations.

- D. D. Warn personnel against breathing of vapors and contact of material with skin or eyes. Wear applicable protective clothing and respiratory protection gear.
- E. E. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

PART 2 - PRODUCTS

2.01 2.1 MANUFACTURERS

- A. Basis of Design: Provide CCW-MIRASEAL Reinforced Liquid Applied Waterproofing Membrane at 120 mil thickness as supplied by Carlisle Coatings and Waterproofing Incorporated.

2.02 2.2 PRODUCTS

- A. A. Waterproofing membrane shall be CCW-MIRASEAL for horizontal surfaces applied at 60 mils for each coat, reinforced by CCW 500 Reinforcing Fabric between coats and CCW-MIRASEAL for vertical surfaces applied at 60 mils for each coat, reinforced by CCW 500 Reinforcing fabric between coats and shall meet or exceed the requirements of ASTM C 836.
 - 1. Or approved equal.

2.03 2.3 ACCESSORY PRODUCTS

- A. A. Surface Primer: is not required for concrete or wood all other surfaces as recommended by manufacturer for each surface encountered.
- B. B. Sealants: Shall be CCW-201 two-component Polyurethane Sealant.
- C. C. Backing Rod: Shall be closed-cell polyethylene foam rod.
- D. D. Flexible Flashing: Shall be as recommended and supplied by coating manufacturer.
- E. E. Protection Course: Shall be CCW Protection Fabric 300HV.
- F. F. Drainage Composite: Shall be CCW MiraDrain™ as recommended by the manufacturer for each condition, if required.
- G. G. Reinforcing: Shall be CCW 500 Reinforcing Fabric.

PART 3 - EXECUTION

3.01 3.1 INSPECTION

- A. A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies. Should any deficiencies exist the architect shall be notified in writing and corrections made.
- B. B. Condition of Concrete Surfaces:
 - 1. 1. The concrete surfaces shall be of sound structural grade free of fins, ridges, voids or entrained air holes.

2. 2. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non-shrink grout or ground to match the unrepaired areas.
3. 3. Surfaces at cold joints shall be on the same plane.

3.02 3.2 SURFACE PREPARATION

- A. A. The concrete surface must be thoroughly clean, dry and free from any surface contaminates or cleaning residue that may harmfully affect the adhesion of the membrane.
- B. B. Install a 1" face, 45 degree cant of CCW-201 polyurethane sealant at all angle changes and inside corners including projections through the deck, walls, curbs, bumpers, etc.
- C. C. All cracks over 1/16" in width and all moving cracks under 1/16" in width shall be saw cut to 1/4" minimum in width and depth. Saw cut a 1/4" by 1/4" kerf around drain flanges. Clean, prime and fill saw cuts flush with CCW-201 polyurethane sealant.
- D. D. All moving cracks over 1/16" wide and all expansion joints less than 1" wide shall be cleaned, primed, fitted with a backing rod and caulked with CCW-201 polyurethane sealant. For larger joints, contact Carlisle representative.
- E. E. Allow all sealant to cure thoroughly.
- F. F. Apply a 6" wide, 45 mils thick stripe-coat of CCW-MIRASEAL centered over all sealed cracks, hairline cracks, joints, and outside corners.
- G. G. Apply a 45 mil thick stripe-coat of CCW-MIRASEAL over sealant cants and extending 4" onto the horizontal deck and up the vertical wall to the height called out on the drawings (minimum 8" recommended).
- H. H. Allow all detail work to cure overnight.
- I. I. All required metal shall be installed at this time. Apply a stripe coat of CCW-MIRASEAL, 45 mils thick, 6" wide, centered over all transitions from concrete to metal flashings and reinforce with CCW Liquifiber reinforcing fabric. Allow the stripe coat to cure a minimum of three (3) hours to a firm consistency.

3.03 3.3 APPLICATION

- A. A. Priming: Primer is not required for adhesion to dry surfaces, non-porous concrete or wood. Consult CCW for other substrates.
- B. B. Apply the CCW-MIRASEAL in one uniform coat at the rate of one gallon minimum per 25 square feet or as needed in order to obtain a minimum thickness of 60 wet mils, including coverage of detail work. Use a 1/4-inch notch squeegee to achieve a uniform thickness, then back roll to smooth coating.
- C. C. Immediately install Carlisle's CCW 500 Reinforcing Fabric working the fabric into the wet CCW-MIRASEAL until fabric is saturated, avoiding trapped air, wrinkles and fishmouths. Cut and lay flat wrinkles and fishmouths.

- D. D. In the event the entire surface is not completed in one day and becomes contaminated, prior to beginning application clean an area 6" wide along the edge of the previously applied membrane with a cloth wet with xylene solvent. New work shall overlap the existing work by 6".
- E. E. Allow the first coat of CCW-MIRASEAL to cure three (3) hours minimum to a firm consistency.
- F. F. Apply the second coat of CCW-MIRASEAL at 25 sf/gallon in a uniform consistency of 60 mils over the first coat of CCW-MIRASEAL. Cover the CCW 500 Reinforcing Fabric for complete encapsulation. Allow MiraSeal cure a minimum of 16 hours prior to installing protection course.

3.04 3.5 PROTECTION COURSE

- A. A. Install CCW Protection Fabric 300HV on horizontal and vertical surfaces. Overlap and attach per manufacturer's recommendation.

END OF SECTION 07 14 00

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SECTION 07 54 00 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adhered system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Cover boards.
- D. Flashings.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Pressure treated wood blocking.

1.03 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.
- D. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.
- E. FM (AG) - FM Approval Guide; Current Edition.
- F. FM DS 1-28 - Wind Design; 2015, with Editorial Revision (2025).
- G. NRCA (RM) - The NRCA Roofing Manual; 2025.
- H. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
- C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and setting plan for tapered insulation.
- D. Manufacturer's qualification statement.

- E. Installer's qualification statement.
- F. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this section with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.
- C. Store materials in weather protected environment, clear of ground and moisture.
- D. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- E. Protect foam insulation from direct exposure to sunlight.

1.07 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F (5 degrees C) or above 100 degrees F (38 degrees C).
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.

1. Warranty Term: 20 years.
2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 1. Carlisle SynTec Systems; Sure-Weld TPO: www.carlisle-syntec.com/#sle.
 2. GAF; EverGuard SA TPO Self-Adhered Roof Membrane 60 mil: www.gaf.com/#sle.
 3. Johns Manville; JM TPO - 60 mil: www.jm.com/#sle.
- B. Insulation and Cover Boards:
 1. Carlisle SynTec Systems: www.carlisle-syntec.com/#sle.
 2. GAF: www.gaf.com/#sle.
 3. Johns Manville: www.jm.com/#sle.

2.02 ROOFING - UNBALLASTED APPLICATIONS

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation and cover board.
- B. Roofing Assembly Requirements:
 1. Insulation Thermal Resistance (R-Value): 3 per inch, minimum; provide thickness as indicated on Drawings.
- C. Acceptable Insulation Types - Constant Thickness Application: Any of types specified.
 1. Minimum 2 layers of polyisocyanurate or extruded polystyrene board.
 2. Bottom layer of polyisocyanurate or extruded polystyrene board covered with single layer of glass fiber board.
- D. Acceptable Insulation Types - Tapered Application: Any of types specified.
 1. Tapered polyisocyanurate or extruded polystyrene board.
 2. Tapered polyisocyanurate or extruded polystyrene board covered with uniform thickness polyisocyanurate or glass fiber board.
 3. Uniform thickness glass fiber board covered with tapered polyisocyanurate or extruded polystyrene board.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
 - a. Thickness: 45 mil, 0.045 inch (1.1 mm), minimum.
 2. Sheet Width: Factory fabricated into widest possible sheets.
 3. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane.

- D. Separation Sheet: Sheet polyethylene; 2 mil, 0.002 inch (0.05 mm) thick.

2.04 COVER BOARDS

- A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
1. Thickness: 5/8 inch (15.9 mm), Type X, fire-resistant.

2.05 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
1. Classifications:
a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
2) Compressive Strength: Classes 1-2-3, Grade 1, 16 psi (110 kPa), minimum.
3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inches (38 mm) thick; Class 1, Grades 1-2-3, 8.4 (1.48), minimum, at 75 degrees F (24 degrees C).
2. Board Size: 48 by 96 inches (1220 by 2440 mm).
3. Board Thickness: 1.5 inches (38 mm).
4. Tapered Board: Slope as indicated; minimum thickness 1 inch (25.4 mm); fabricate of fewest layers possible.
5. Board Edges: Square.
- B. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578, with natural skin surface and drainage channels on one face.
1. Board Size: 48 by 96 inches (1220 by 2440 mm).
2. Board Thickness: 1-1/2 inches (38 mm).
3. Tapered Board: Slope as indicated; minimum thickness 1/2 inch (12.7 mm); fabricate of fewest layers possible.

2.06 ACCESSORIES

- A. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- B. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches (152 mm) wide; self adhering.
- C. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- D. Membrane Adhesive: As recommended by membrane manufacturer.
- E. Insulation Adhesive: As recommended by insulation manufacturer.
- F. Strip Reglet Devices: Galvanized steel, maximum possible lengths per location, with attachment flanges.
- G. Sealants: As recommended by membrane manufacturer.

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 PREPARATION - WOOD DECK

- A. Verify flatness and tightness of joints in wood decking; fill knot holes with latex filler.

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 cold or wet weather conditions.
- 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 INSTALLATION - INSULATION, UNDER MEMBRANE

- A. Attachment of Insulation:
 - 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and FM DS 1-28 Factory Mutual requirements.
 - 2. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.
- B. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inches (152 mm) from joints of preceding layer.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
- G. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches (457 mm).
- H. Do not install more insulation than can be covered with membrane in same day.

3.05 INSTALLATION - MEMBRANE

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate per manufacturer's instructions. Fully embed membrane in adhesive except in areas directly over or within 3 inches (76 mm) of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches (76 mm). Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 4 inches (102 mm) onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
 - 3. Secure flashing to nailing strips at 4 inches (102 mm) on center.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and sumps and related flashings.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Owner will provide testing services, and Contractor to provide temporary construction and materials for testing in accordance with requirements.
- C. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.

3.07 CLEANING

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.08 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION 07 54 00

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SECTION 07 92 00 - JOINT SEALANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Nonstaining silicone joint sealants.
- B. Accessories
- C. Polyurethane Sealants
- D. Acrylic Sealants
- E. Butyl Sealants

1.03 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.
- B. Section 07 91 00 - Preformed Joint Seals: Precompressed foam, gaskets, and strip seals.
- C. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- D. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.04 REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).
- B. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
- D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- F. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2022.

- G. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include 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. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
 - 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
- C. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: The selected colors for each sealant.
- E. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant location and designation.
 - 2. Manufacturer and product name.
 - 3. Type of substrate material.
 - 4. Proposed test.
 - 5. Number of samples required.
- F. Informational Submittals
 - 1. Sustainable Design Documentation: For sealants and primers, submit VOC content and emissions documentation; see Section 01 61 16.
 - 2. Preconstruction Laboratory Test Reports: For each joint sealant and substrate material to be tested from sealant manufacturer, indicating the following:
 - a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - b. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
 - 3. Preinstallation Field Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified.
 - 4. Sample Warranties
- G. Executed Warranties.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

- B. Testing Agency Qualifications: Qualified in accordance with ASTM C1021 to conduct the testing indicated.
- 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. Allow sufficient time for testing to avoid delaying the work.
 - 4. Deliver sufficient samples to manufacturer for testing.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
- D. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Site in original sealed containers marked with the following:
 - 1. Supplier.
 - 2. Name of material.
 - 3. Specification number.
 - 4. Color.
 - 5. Expiration date.
 - 6. Curing time.
 - 7. Mixing instructions.
- B. Store and protect sealant materials per the Sealant Manufacturer's written instructions. Do not use outdated materials.
- C. Follow the Sealant Manufacturer's recommended special precautions where hazardous materials are involved.

1.08 PROJECT CONDITIONS

- A. Apply sealant within temperatures recommended by the Sealant Manufacturer. Consult with the Sealant Manufacturer when sealants cannot be applied within the recommended ranges.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 2-years from date of Substantial Completion
- C. Manufacturer Warranty: PManufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 5-years from date of Substantial Completion

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. BASF Building Systems: www.basf.com/us/en/products/General-Business-Topics/dispersions/Industries/construction2/building-materials/Caulks-and-Sealants
- B. Dow: www.dow.com/#sle.
- C. Henry Company: www.henry.com/#sle.
- D. Pecora Corporation: www.pecora.com/#sle.
- E. Sika Corporation: usa.sika.com/#sle.
- F. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
- G. W. R. Meadows, Inc: www.wrmeadows.com/#sle.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
 - 1. Exterior Joints:
 - a. Seal open joints except open joints indicated on drawings as not sealed.
 - 2. Interior Joints:
 - a. Seal open joints except specific open joints indicated on drawings as not sealed.
 - b. Seal the following joints:
 - 1) In sound-rated wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.
 - 3. Do Not Seal:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be covered with expansion joint cover assemblies.
 - c. Joints where sealant installation is specified in other sections.
- B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
- C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
- D. Interior Wet Areas: restrooms; fixtures in wet areas include plumbing fixtures, countertops, and other similar items.

2.03 JOINT SEALANTS - GENERAL

- A. Compatibility: Provide joint sealants, backings, 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: As selected by Architect from manufacturer's full range.

2.04 NONSTAINING SILICONE JOINT SEALANTS

- A. Type 1 - Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's full range.
 - 3. Cure Type: Single-component, neutral moisture curing.
 - 4. Products: Basis of Design
 - a. Tremco Commercial Sealants & Waterproofing; Spectrem 4-TS: www.tremcosealants.com/#sle.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Type 2 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Color: As selected from manufacturer's full range..
 - 2. Products: Basis of Design
 - a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
 - b. Sika Corporation; Sikasil N Plus US: usa.sika.com/#sle.

2.05 POLYURETHANE SEALANTS

- A. Type 3 - Polyurethane Sealant: ASTM C920, Type M, Class 25, Use NT, M, A, & O, non-staining, non-bleeding; multi-component; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's full range.
 - 3. Products:
 - a. Pecora Corporation; DynaTrol II: www.pecora.com/#sle.
 - b. Sika Corporation; Sikaflex-2c NS EZ Mix+: usa.sika.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Dymonic 100: www.tremcosealants.com/#sle.
 - d. BASF; Sonolastic NP-2 .

2.06 ACRYLIC SEALANTS

- A. Type 4 - Acrylic-based, single-component, solvent-curing, conforming to requirements of FS TT-S-00230C(2), non-staining, non-bleeding, non-sagging.
 - 1. Color: To be selected by Architect from manufacturer's full range.
 - 2. Products:
 - a. Pecora Corporation; AC-20 +Silicone: www.pecora.com/#sle.
 - b. Tremco Commercial Sealants & Waterproofing; Mono 555: www.tremcosealants.com/#sle.
 - c. S-M; SM-5522.
- B. Type 5 - Non-bleeding, non-sagging, non-staining, paintable, single-component, siliconized 100-percent acrylic latex sealant per ASTM C834
 - 1. Color: To be selected by Architect from manufacturer's full range.
 - 2. Products:
 - a. BASF; Sonolac
 - b. Bostik; Chem-Calk 600

- c. Pecora; AC-20
- d. Tremco; Tremflex 834

2.07 BUTYL SEALANTS

- A. Type 6 - Butyl rubber and polyisobutylene blend, single-component, conforming to requirements of CID A-A-272A, Type I and; ASTM C1311, non-staining
 - 1. Color: To be selected by Architect from manufacturer's full range.
 - 2. Products:
 - a. Pecora Corporation; BC-158: www.pecora.com/#sle.
 - b. Bostik; Chem-Calk 300.
 - c. TREMCO; Butyl Sealant

2.08 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- B. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- C. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.
- E. Bond Breaker ([as indicated on the Drawings and] where required): Pressure-sensitive tape recommended by the Sealant Manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Report defects in writing to the Architect and do not proceed until defects have been corrected. Commencement of the Work of this Section will constitute acceptance of the conditions of the substrate surfaces to which sealant is to be applied.
- B. Verify that joint dimensions, physical, and environmental conditions are acceptable to receive the Work of this Section.
- C. Verify that joint shaping materials and release tapes are compatible with sealant.
- D. Examine joint dimensions. Size materials to achieve required width/depth ratios.

3.02 PREPARATION

- A. Clean, prepare, and size joints per the Sealant Manufacturer's instructions. Thoroughly clean joints, completely removing foreign matter such as dust, paint (unless a permanent protective coating), oil, grease, waterproofing or water-repellant treatments, water, surface dirt, and frost – and other contaminants that might impair adhesion of sealant.
- B. Clean porous materials including concrete, [and] masonry [and unglazed surfaces of ceramic tile] by brushing, grinding, blast cleaning, mechanical abrading, acid-washing, or a combination of these methods to provide a clean, sound substrate for optimum sealant adhesion.
 - 1. Admixtures in precast concrete can affect bond of sealant with concrete. Conduct adhesion test on joints to determine if grinding can be waived.
- C. If required, cut back surface of concrete to remove contaminants and expose a clean surface. Remove laitance from concrete by acid-washing, grinding, or mechanical abrading. Remove oils by blast cleaning. Prior to application of primer or sealant, blow out joints with oil-free compressed air or vacuuming.
- D. Clean non-porous surfaces, such as metal, [and] glass, [porcelain enamel, and glazed surfaces of ceramic tile] chemically or by other means acceptable to the Sealant Manufacturer and the manufacturer of the substrate.
- E. Remove temporary protective coatings on metallic surfaces using a solvent that leaves no residue. Wipe clean. Do not remove permanent coatings intended to remain.
- F. To allow sealants to perform properly, use joint filler to achieve required joint depth.
- G. Use bond breaker where required.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Prior to the general commencement of the Work of this Section, install a 5-foot length of each type of sealant to the substrates for which it is intended. Allow to cure. Examine to determine whether proper adhesion has been obtained.
- 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.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 09 91 13 - Exterior Painting: Field painting.
- C. Section 09 91 23 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

- A. ANSI: American National Standards Institute.
- B. ASCE: American Society of Civil Engineers.
- C. HMMA: Hollow Metal Manufacturers Association.
- D. NAAMM: National Association of Architectural Metal Manufacturers.
- E. NFPA: National Fire Protection Association.
- F. SCIF: Sensitive Compartmented Information Facility.
- G. SDI: Steel Door Institute.
- H. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.

- F. 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; 2024.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.
- H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- I. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- K. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: <https://steeldoors.org/sdi-certified/#sle>.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Premier Steel Doors and Frames: www.trustpremier.com/#sle.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Exterior Doors: Thermally insulated.
 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 20 gauge, 0.032 inch (0.8 mm), minimum.
 2. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
 3. Top Closures for Outswinging Doors: Flush with top of faces and edges.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Full profile/continuously welded type.
 1. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
 2. Frame Finish: Factory primed and field finished.
 3. Weatherstripping: Separate, see Section 08 71 00.
- C. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- D. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches (102 mm) high to fill opening without cutting masonry units.

2.05 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.06 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.07 ACCESSORIES

- A. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- B. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- C. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- D. Install door hardware as specified in Section 08 71 00.

3.04 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION 08 11 13

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SECTION 08 31 00 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall-mounted access units.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

1.04 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Size: 16 by 16 inches (406 by 406 mm).
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 4. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
- B. Wall-Mounted Units in Wet Areas:
 - 1. Location: As indicated on drawings.
 - 2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
 - 3. Size: 16 by 16 inches (406 by 406 mm).
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 5. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.

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.

END OF SECTION 08 31 00

SECTION 08 71 00 - DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for hollow metal doors.
- B. Thresholds.
- C. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.
- B. Section 08 11 13 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. BHMA (CPD) - Certified Products Directory; Current Edition.
- C. BHMA A156.1 - Standard for Butts and Hinges; 2021.
- D. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.
- E. BHMA A156.4 - Door Closers and Pivots; 2024.
- F. BHMA A156.16 - Standard for Auxiliary Hardware; 2023.
- G. BHMA A156.18 - Standard for Materials and Finishes; 2020.
- H. BHMA A156.20 - Standard for Strap and Tee Hinges, and Hasps; 2021.
- I. BHMA A156.21 - Thresholds; 2025.
- J. BHMA A156.22 - Standard for Gasketing; 2021.
- K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Keying Requirements Meeting:
 - 1. Attendance Required:
 - a. Installer's Architectural Hardware Consultant (AHC).
 - 2. Agenda:
 - a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - 3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 - a. Key control system requirements.
 - 4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
 - 5. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - 2. Provide complete description for each door listed.
 - 3. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 - 4. Include account of abbreviations and symbols used in schedule.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.
- F. Supplier's qualification statement.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

- C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
 - 1. Closers: Five years, minimum.
 - 2. Locksets and Cylinders: Three years, minimum.
 - 3. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Accessibility: ADA Standards and ICC A117.1.
 - 3. Listed and certified compliant with specified standards by BHMA (CPD).
 - 4. Auxiliary Hardware: BHMA A156.16.
 - 5. Straps and Tee Hinges: BHMA A156.20.
 - 6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
- D. Fasteners:
 - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 - 2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - a. Self-drilling (Tek) type screws are not permitted.
 - 3. Fire-Rated Applications: Comply with NFPA 80.
 - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 HINGES

- A. Manufacturers:
 - 1. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. BEST, dormakaba Group: www.bestaccess.com/#sle.
- B. Hinges: Comply with BHMA A156.1, Grade 1.
 - 1. Provide hinges on every swinging door.
 - 2. Provide following quantity of butt hinges for each door:
 - a. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.

2.03 CYLINDRICAL LOCKS

- A. Manufacturers:
 - 1. Schlage, an Allegion brand: www.allegion.com/us/#sle.
- B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
 - 1. Bored Hole: 2-1/8 inch (54 mm) diameter.
 - 2. Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
 - 3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
 - 4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Finish: To match lock or latch.

2.04 CLOSERS

- A. Manufacturers; Surface Mounted:
 - 1. Sargent; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. LCN, an Allegion brand: www.allegion.com/us/#sle.
- B. Closers: Comply with BHMA A156.4, Grade 1.
 - 1. Type: Surface mounted to door.
 - 2. Provide door closer on each exterior door.

2.05 KICK PLATES

- A. Manufacturers:
 - 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 - 2. Rockwood an Assa Abloy Group company: www.assaabloydss.com/#sle..
- B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 - 1. Size: 8 inch (203 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.06 WALL STOPS

- A. Manufacturers:
 - 1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Hager Companies: www.hagerco.com/#sle.

- B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Type: Bumper, concave, wall stop.
 - 2. Material: Aluminum housing with rubber insert.

2.07 THRESHOLDS

- A. Manufacturers:
 - 1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Hager Companies: www.hagerco.com/#sle.
 - 3. Reese Enterprises, Inc: www.reeseusa.com/#sle.
- B. Thresholds: Comply with BHMA A156.21.
 - 1. Provide threshold at each exterior door, unless otherwise indicated.
 - 2. Type: Flat surface.
 - 3. Material: Aluminum.
 - 4. Threshold Surface: Fluted horizontal grooves across full width.
 - 5. Field cut threshold to profile of frame and width of door sill for tight fit.
 - 6. Provide non-corroding fasteners at exterior locations.

2.08 WEATHERSTRIPPING AND GASKETING

- A. Manufacturers:
 - 1. Hager Companies: www.hagerco.com/#sle.
 - 2. Reese Enterprises, Inc: www.reeseusa.com/#sle.
- B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
 - 1. Head and Jamb Type: Adjustable.
 - 2. Door Sweep Type: Door shoe with drip cap.
 - 3. Material: Aluminum, with brush weatherstripping.

2.09 SILENCERS

- A. Manufacturers:
 - 1. Ives, an Allegion brand: www.allegion.com/us/#sle.
 - 2. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
- B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 - 1. Single Door: Provide three on strike jamb of frame.
 - 2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 - 3. Material: Rubber, gray color.

2.10 FINISHES

- A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
 - 1. Primary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
 - 2. Secondary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
 - a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
 - 3. Exceptions:
 - a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
- D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 ADJUSTING

- A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.04 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

3.05 PROTECTION

- A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

3.06 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

- 1. Quantities listed are for each pair of doors, or for each single door.
- 2. The supplier is responsible for handing and sizing all products.
- 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

- B. Basis of Design Manufacturer's Abbreviations:

- 1. MK - McKinney
- 2. PE - Pemko
- 3. SU - Securitron
- 4. SA - SARGENT
- 5. SC - Schlage
- 6. AD - Adams Rite
- 7. AT - Accurate Lock and Hardware
- 8. AH - Architectural Builders Hardware
- 9. ZE - Zero International
- 10. OT - Other

- C. Hardware Set 1.0

- 1. Description: Single Exterior Storage Room
- 3 Hinge, Full Mortise, Hvy Wt T4A3386 4-1/2" x 4-1/2" US32D MK
- 1 Storeroom Lock LC 8204 LNP US26D SA
- 1 Core 30-138 626 SC
- 1 Kick Plate K1050 10" H x 2" LDW CSK BEV US32D RO
- 1 Wall Stop 406 US32D RO
- 1 Threshold 1715A PE
- 1 Gasketing 290AS (Head & Jambs) PE
- 1 Sweep 315CN PE

- D. Hardware Set 2.0

- 1. Description: Single Exterior Restroom
- 3 Hinge, Full Mortise TA2314 4-1/2" x 4-1/2" US32D MK
- 1 Classroom Lock LB LC 4877 US26D SA
- 1 Core 30-138 626 SC
- 1 Surface Closer 281 O EN SA

J20251137.000
Jacksonville Jumbo Shrimp - Bullpen Relocation

Bid/Permit Set
10-17-2025

1	Wall Stop	406	US32D	RO
1	Threshold	1715A		PE
1	Sweep	315CN		PE
3	Silencer	608-RKW		RO

END OF SECTION 08 71 00

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025.
- E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).
- G. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.
- J. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

- L. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- M. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
- N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- O. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.
- P. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- Q. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.
- B. Sequencing: Install service utilities in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide data on each board product specified.
 - 2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Shop Drawings: Indicate special details associated with locations and installation of control and expansion joints, fireproofing, and acoustic seals. Include plans, elevations, sections, details of components, and attachments to other work.
- D. Samples: For the following products:
- E. Trim Accessories: Submit two Full-size Sample in 12-inch long length for each trim accessory indicated.

1.06 Delivery, Storage, and Handling

- A. Deliver materials in the respective manufacturer's original packages showing the respective manufacturer's name and product brand name.
- B. Store gypsum products and accessories indoors and keep dry, above freezing, and protected from weather, condensation, direct sunlight, construction traffic. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations to prevent sagging.
- C. Store metal products to prevent corrosion and protect from bending.
- D. Protect ends, edges, and faces of gypsum boards from damage.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. Obtain each type of gypsum panel and joint finishing material from single sources with resources to provide products of consistent quality in appearance and physical properties.
 - 2. See PART 3 for finishing requirements.
- B. Interior Partitions: Provide completed assemblies with the following characteristics:

2.02 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
 - 1. Corrosion Protection Coating Designation: G40, or equivalent in accordance with AISI S220.
- B. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. MarinoWARE: www.marinoware.com/#sle.
 - 3. Telling Industries: www.tellingindustries.com/#sle.
- C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
 - 1. Studs: C-shaped with knurled or embossed faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Flexible Track: Flexible framing consisting of adjustable leg straps and pivoting, hinged track brackets designed to provide curved framing assemblies of varying radii.
 - a. Dimensions: in size, lengths and configurations indicated.
 - 4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
 - 5. Furring Members: U-shaped sections, minimum depth of 3/4 inch (19 mm).
 - 6. Furring Members: Zee-shaped sections, minimum depth of 1 inch (25 mm).
- D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
 - 3. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.
 - a. Products:
 - 1) ClarkDietrich; BlazeFrame RipTrak: www.clarkdietrich.com/#sle.
 - 2) FireTrak Corporation; Posi Klip: www.fire-trak.com/#sle.
 - 3) MBA Building Supplies; Slotted Slip Track: www.mbastuds.com/#sle.
 - 4) Metal-Lite, Inc; The System: www.metal-lite.net/#sle.

- E. Non-structural Framing Accessories:
 - 1. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 - 3. USG Corporation: www.usg.com/#sle.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required at Restroom walls and ceilings.
 - 3. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm).
 - b. Ceilings: 5/8 inch (16 mm).
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
- C. Shaftwall and Coreboard: Type X; 1 inch (25 mm) thick by 24 inches (600 mm) wide, beveled long edges, ends square cut.
 - 1. Paper-Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. Framing: Gypsum Liner Panels attach to metal framing; CH studs. Refer to product data sheet for additional information.

2.04 GYPSUM BOARD ACCESSORIES

- A. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 - 1. Corner Beads: Low profile, for 90 degree outside corners.
 - 2. L-Trim with Tear-Away Strip: Sized to fit 1/2-inch (13 mm) thick gypsum wallboard.
- B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
- C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.
- D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.
- E. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence. Examine areas and substrates with Installer present for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.
- B. Studs: Space studs at 16 inches on center (at 406 mm on center).
 - 1. Extend partition framing as indicated on the drawings.
 - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 - 3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- D. Blocking: Install wood blocking for support of:
 - 1. Framed openings.
 - 2. Wall-mounted cabinets.
 - 3. Plumbing fixtures.
 - 4. Toilet partitions.
 - 5. Toilet accessories.
 - 6. Wall-mounted door hardware.

3.03 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 3. Exception: Tapered edges to receive joint treatment at right angles to framing.

4. Exception: At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 5. Exception: On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 6. Fastening Methods: Fasten base layers and face layers separately to supports with screws
- C. Multi-Layer, Nonrated:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
- D. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- F. Form control and expansion joints with space between edges of adjoining gypsum panels.
- G. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally
1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- I. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

- J. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- K. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- L. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- M. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

3.04 JOINT TREATMENT

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- C. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- D. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- E. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
- F. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.05 Protection

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed gypsum board assemblies from subsequent construction operations.

- C. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- D. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient base.
- B. Installation accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021 (Reapproved 2025).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

1.07 FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TS, rubber, vulcanized thermoset; Style B, Cove.

1. Manufacturers:
 - a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
 - b. Mannington Commercial: www.manningtoncommercial.com/#sle.
 - c. Roppe Corporation; Contours Profiled Wall Base System: www.roppe.com/#sle.
2. Height: 4 inches (100 mm).
3. Thickness: 0.125 inch (3.2 mm).
4. Finish: Satin.
5. Length: Coils in manufacturer's standard length.
6. Color: To be selected by Architect from manufacturer's full range.
7. Accessories: Premolded external corners and internal corners.

2.02 ACCESSORIES

- A. Moldings, Transition and Edge Strips: Rubber..
 1. Manufacturers:
 - a. Mannington Commercial: www.manningtoncommercial.com/#sle.
 - b. Johnsonite, a Tarkett Company.
 - c. Roppe Corporation

2.03 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.02 Installation - General

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.

3.03 Installation - Resilient Base

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.04 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

END OF SECTION 09 65 13

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SECTION 09 65 66 - RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rubber tile, adhesively installed.

1.02 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
- D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
- E. ASTM F2772 - Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems; 2011 (Reapproved 2019).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. 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.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.
- D. Selection Samples: Manufacturer's color charts for flooring materials specified, indicating full range of colors and textures available.
- E. Verification Samples: Actual flooring material specified, not less than 12 inch (305 mm) square, mounted on solid backing.
- F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

- A. The installation area must be fully enclosed, weather tight, and climate controlled between 63°F and 75°F and 40% to 60% ambient relative humidity (RH) for at least 48 hours prior, during and 72 hours after installation (do not use gas fueled blowers). Dew point must be avoided. The substrate must be at least 5°F above dew point to be considered acceptable.

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

- A. Rubber Tile Flooring: Recycled vulcanized rubber and colored granules.
 - 1. Thickness: Minimum 0.36 inch (9 mm).
 - 2. Tile Edge/Installation: Straight, adhesive installation.
 - 3. Surface Texture: Hammered.
 - 4. Color: Included in Basis of Design.
 - 5. Products:
 - a. Basis-of-Design: nora systems, Inc., 9 Northeastern Blvd., Salem, NH 03079; telephone 800-332-NORA or 603-894-1021..
 - 1) norament 992, Article 1955
 - 6. Limited Wear Warranty: 15 years

2.02 ACCESSORIES

- A. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

3.02 PREPARATION

- A. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.
- B. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Rubber Tile Flooring:
 - 1. Lay out center lines in spaces to receive tile flooring, based on location of principal walls. Start tile installation from center, and adjust as necessary to avoid tiles less than one-half width at perimeter.
 - 2. Lay tiles square with room axis, matching for color and pattern by selecting from cartons and mixing as recommended by manufacturer.
 - 3. Spread only enough adhesive to permit installation of materials before initial set.
 - 4. Fit joints and butt seams tightly; press with heavy roller to attain full adhesion.

3.04 CLEANING

- A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

- A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION 09 65 66

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SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

- A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- C. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.

- D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Paints:
 - 1. Florida Paints and Coatings, LLC: www.floridapaints.com/#sle.
 - 2. Pittsburgh Paints: www.ppgpaints.com/#sle.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- B. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, and primed metal.
- B. Concrete/Masonry, Opaque, Alkyd, 3 Coat:
 - 1. One coat of block filler.
 - 2. Semi-gloss: Two coats of alkyd enamel.
- C. Ferrous Metals, Primed, Alkyd, 2 Coat:
 - 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 - 2. Semi-gloss: Two coats of alkyd enamel.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 - 1. Interior/Exterior Latex Block Filler.
 - a. Products:
 - 1) Florida Paints and Coatings, LLC; Fortifill Acrylic Airless Masonry Filler FP3550: www.floridapaints.com/#sle.
 - 2) Kilz Pro-X p50 Block Filler Primer.
 - 3) Pittsburgh Paints; Perma-Crete Concrete Block & Masonry Surfacer/Filler, 4-100XL (MPI #4)
 - 4) Sherwin-Williams Pro Industrial Heavy Block Filler. (MPI #4)

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- G. Masonry:
- H. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance.

- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 91 13

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SECTION 09 91 23 - INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 09 91 13 - Exterior Painting.

1.03 REFERENCE STANDARDS

- A. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- D. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).

3. Cross-reference to specified paint system products to be used in project; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 1. Where sheen is specified, submit samples in only that sheen.
- D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 1. Florida Paints and Coatings, LLC: www.floridapaints.com/#sle.
 2. Pittsburgh Paints: www.ppgpaints.com/#sle.
 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

- C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, and shop primed steel.
1. Two top coats and one coat primer.
- B. Concrete/Masonry, Opaque, Alkyd, 3 Coat:
1. One coat of block filler.
 2. Semi-gloss: Two coats of alkyd enamel.
- C. Ferrous Metals, Primed, Alkyd, 2 Coat:
1. Touch-up with alkyd primer.
 2. Semi-gloss: Two coats of alkyd enamel.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Interior/Exterior Latex Block Filler.
 - a. Products:
 - 1) Florida Paints and Coatings, LLC; Fortifill Acrylic Airless Masonry Filler FP3550: www.floridapaints.com/#sle.
 - 2) Pittsburgh Paints; Perma-Crete Concrete Block & Masonry Surfacer/Filler, 4-100XI. (MPI #4)
 - 3) Sherwin-Williams Loxon Block Surfacer. (MPI #4)
 - 4) Zinsser by Rust-Oleum Corporation Block Filler 2X High Build Primer for Concrete: www.rustoleum.com/#sle. (MPI #4)
 2. Interior Drywall Primer Sealer.
 - a. Products:
 - 1) Florida Paints and Coatings, LLC; Hi Five Interior Hi-Build Latex Vinyl Acrylic Primer Surfacer FP4400: www.floridapaints.com/#sle.
 - 2) KILZ PVA Drywall Primer [No.PX010].
 - 3) Pittsburgh Paints Speedhide Interior Latex Sealer, 6-2.
 - 4) Zinsser by Rust-Oleum Corporation Drywall Primer: www.rustoleum.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
 - 1. Clean concrete according to ASTM D4258. Allow to dry.
- F. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
- G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

END OF SECTION 09 91 23

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SECTION 10 28 00 - RESTROOM ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- B. ASTM C1036 - Standard Specification for Flat Glass; 2025.
- C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Restroom Accessories:
 - 1. American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. Bradley Corporation: www.bradleycorp.com/#sle.
 - 3. Georgia-Pacific Professional: www.gppro.com/#sle.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

- B. Stainless Steel Sheet: ASTM A666/A666M, Type 304.
- C. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- D. Adhesive: Two component epoxy type, waterproof.
- E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 Commercial Toilet Accessories

- A. Waste Receptacle: Stainless steel, freestanding style with swing top.
- B. Waste Receptacle: Recessed, stainless steel, seamless lower door for access to container, with tumbler lock, reinforced panel full height of door, push-in self-closing top door, continuously welded bottom pan and seamless exposed flanges.
- C. Automated Soap Dispenser: Foam soap dispenser, deck-mounted on vanity, with container concealed below deck; chrome-plated brass with bright polished finish; chrome-plated deck escutcheon.
- D. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick tempered safety glass; ASTM C1048.
 - 1. Size: As indicated on drawings.
 - 2. Frame: 0.05 inch (1.3 mm) angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 3. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.
- E. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
- F. Grab Bars: Stainless steel, smooth surface.
 - 1. Heavy Duty Grab Bars: Floor supports are acceptable if necessary to achieve load rating.
 - a. Push/Pull Point Load: Minimum 1000 pound-force (4448.2 N), minimum.
 - b. Dimensions: 1-1/2 inch (38 mm) outside diameter, minimum 0.125 inch (3.17 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
 - c. Length and Configuration: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.

- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

3.02 PREPARATION

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 28 00

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SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group, Inc. - JL Industries; Cosmic Extinguisher - Multipurpose Chemical: www.activarcpg.com/#sle.
 - 2. Ansul, a Tyco Business: www.ansul.com/#sle.

3. Fire-End & Croker Corporation: www.croker.com/#sle.
4. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
5. Pyro-Chem, a Tyco Business: www.pyrochem.com/#sle.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 1. Class: A:B:C type.
 2. Size: 5 pound (2.27 kg).
 3. 2A, 10B, 1C throughout. 20B in maintenance areas
- C. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
 1. Class: K type.
 2. Size and classification as required.
 3. Temperature range: Minus 20 degrees F (Minus 29 degrees C) to 120 degrees F (49 degrees C).

2.03 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Lettering: "FIRE EXTINGUISHER" decal, or vinyl self-adhering, prespaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.

3.02 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 10 44 00

SECTION 11 68 00 - PLAYFIELD EQUIPMENT & STRUCTURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes field equipment as follows:
 - 1. Home Plate
 - 2. Pitching Rubbers

1.02 REFERENCES

- A. Comply with applicable requirements of the following standards:
 - 1. Minor League Baseball (MiLB).
 - 2. International Association of Athletics Federations (IAAF).
 - 3. American Sports Builders Association (ASBA).
 - 4. Manufacturers Data and Recommended Installation Requirements.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of equipment.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Provide drawings of the manufacturer's recommended installation requirements.
- C. Samples for Verification: For each type of exposed finish on the following products:
 - 1. Include Samples of accessories to verify color and finish selection.
 - 2. Platforms/Seats/Benches: Minimum 6 inches (150 mm) square.
 - 3. Molded Plastic/Rubber/Turf Options: Minimum 3 inches (76 mm) square.

1.04 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of equipment.
- B. Field quality-control reports.
- C. Sample Warranty: For manufacturer's special warranties.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For equipment and finishes to include in maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm whose equipment components have been certified by third-party product certification service.

1.07 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of field equipment that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - 2. Structural failures.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 4. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 FIELD EQUIPMENT

- A. Home Plate
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide “Schutt Bury All Home Plate – SHSRHP” as manufactured by Sportsfield Specialties, Inc. or comparable product/system as approved by Architect.
 - 2. Shall meet or exceed current MiLB specifications, rules, and requirements.
- B. Pitching Rubber
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide “24 inch Four Sided Professional Pitching Rubber – SHBBPB” as manufactured by Sportsfield Specialties, Inc. or comparable product/system as approved by Architect.
 - 2. Shall meet or exceed current MiLB specifications, rules, and requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor baseball field equipment securely, positioned at locations and elevations indicated.

END OF SECTION 11 68 00

SECTION 22 00 00 - SHEET SPECIFICATION - PLUMBING

PART 1 GENERAL

1.01 GENERAL

- A. THE WORK COVERED BY THIS SECTION OF THE SPECIFICATIONS CONSISTS OF FURNISHING ALL LABOR, EQUIPMENT, MATERIALS AND SERVICE NECESSARY FOR, AND REASONABLY INCIDENTAL TO, THE PROPER COMPLETION OF ALL PLUMBING WORK SHOWN ON THE DRAWINGS AND HEREIN SPECIFIED.
- B. ALL PIPES, FITTINGS, ACCESSORIES UTILIZED TO CONVEY POTABLE WATER SHALL COMPLY WITH NSF 61 AND NSF 372.
- C. THE CONTRACTOR SHALL VISIT THE SITE AND THOROUGHLY INSPECT CONDITIONS AFFECTING THE WORK BEFORE SUBMITTING BID. ASSUME RESPONSIBILITY FOR MEETING ALL EXISTING CONDITIONS INCLUDING ACCESS AND WORKSPACE LIMITATIONS.
- D. THE CONTRACTOR SHALL PROVIDE THE FOLLOWING SYSTEMS AND EQUIPMENT, AND ALL OTHER ITEMS OF PLUMBING.
 - 1. FULLY INSTALL, TEST AND PROVE ALL PLUMBING SYSTEMS IN ACCORDANCE WITH THE LATEST EDITION OF THE FLORIDA BUILDING CODE - ALL VOLUMES, NFPA 101 LIFE SAFETY CODE, LATEST EDITION FIRE PROTECTION CODE, AND ANY AND ALL OTHER REGULATIONS AND ORDINANCES HAVING JURISDICTION OVER THE SCOPE OF THE WORK.
 - 2. A COMPLETE SYSTEM OF SOIL, WASTE AND VENT PIPING TO ALL FIXTURES AND LOCATIONS SHOWN ON DRAWINGS OR CALLED FOR, AND CONNECTION TO EXISTING SOIL, WASTE AND VENT PIPING WHERE SHOWN ON DRAWINGS.
 - 3. A COMPLETE SYSTEM OF STORM DRAIN PIPING WHERE SHOWN ON DRAWINGS OR CALLED FOR, AND CONNECTION TO EXISTING STORM PIPING WHERE SHOWN ON DRAWINGS.
 - 4. THE INSTALLATION OF A COMPLETE SYSTEM OF DOMESTIC HOT WATER, HOT WATER RETURN, AND COLD WATER PIPING TO ALL LOCATIONS SHOWN ON DRAWINGS OR CALLED FOR, AND CONNECTION TO EXISTING WATER PIPING WHERE SHOWN ON DRAWINGS.
 - 5. THE INSTALLATION OF ALL FIXTURES, FITTINGS, PIPING, AND ACCESSORIES AS SHOWN ON THE PLUMBING DRAWINGS AND HEREINAFTER SPECIFIED, FURNISHED BY THE PLUMBING CONTRACTOR.
 - 6. SECURE ALL PERMITS AND INSPECTIONS AND PAY ALL FEES INCIDENTAL TO THE PLUMBING PORTION OF THE WORK.
 - 7. PROVIDE ALL REQUIRED CHASES, SLEEVES AND OPENINGS REQUIRED. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR HIS OWN CUTTING AND PATCHING.
 - 8. FLUSHING AND STERILIZATION OF PIPING.

9. THE INSULATION OF ALL NEW ABOVE GROUND HORIZONTAL ROOF DRAIN PIPING INCLUDING FIRST AND LAST FITTING CONNECTED TO A VERTICAL RUN, DOMESTIC HOT WATER PIPING, HOT WATER RETURN PIPING, COLD WATER PIPING, AND ABOVE-GROUND SANITARY PIPING WHEN RECEIVING CHILLED WATER/COOLING COIL CONDENSATE WASTE.
10. ALL OTHER ITEMS OF PLUMBING SPECIFIED HEREIN OR SHOWN ON THE PLANS.

1.02 DEFINITIONS

- A. "PROVIDE" - TO FURNISH AND INSTALL MATERIAL UNDER THIS CONTRACT.
- B. "FURNISH" - TO SUPPLY THE MATERIAL TO THE GENERAL CONTRACTOR TO BE INSTALLED BY OTHERS. PRIOR TO BID, CLEARLY AND SEPARATELY LIST ALL ITEMS TO BE INSTALLED BY OTHERS.
- C. "INSTALL" - TO SUPPLY THE LABOR TO INSTALL MATERIAL FURNISHED BY THE GENERAL CONTRACTOR OR OTHERS. PRIOR TO BID, CLEARLY AND SEPARATELY LIST ALL ITEMS TO BE FURNISHED BY OTHERS.
- D. AHRI - AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE
- E. ANSI - AMERICAN NATIONAL STANDARDS INSTITUTE INTERNATIONAL
- F. ASHRAE - AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS
- G. ASSE - AMERICAN SOCIETY OF SANITARY ENGINEERING
- H. ASME - AMERICAN SOCIETY OF MECHANICAL ENGINEERS INTERNATIONAL
- I. ASTM - AMERICAN SOCIETY FOR TESTING AND MATERIALS INTERNATIONAL
- J. AWWA - AMERICAN WATER WORKS ASSOCIATION EPA - U.S. ENVIRONMENTAL PROTECTION AGENCY
- K. ICC IPC - INTERNATIONAL CODE COUNCIL INTERNATIONAL PLUMBING CODE
- L. MSS - MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY
- M. MSS SP-58 (2009) - PIPE HANGERS AND SUPPORTS - MATERIALS, DESIGN AND MANUFACTURE, SELECTION, APPLICATION, AND INSTALLATION
- N. MSS SP-69 (2003 - NOTICE 2012) PIPE HANGERS AND SUPPORTS - SELECTION AND APPLICATION (ANSI APPROVED AMERICAN NATIONAL STANDARD)
- O. NFPA - NATIONAL FIRE PROTECTION ASSOCIATION
- P. NSF-61 - NSF/ANSI STANDARD 61: DRINKING WATER SYSTEM COMPONENTS - HEALTH EFFECTS
- Q. PDI - PLUMBING AND DRAINAGE INSTITUTE UL - UNDERWRITERS LABORATORIES

1.03 COORDINATION

- A. CONTRACTOR SHALL COORDINATE THE WORK OF THE DIFFERENT TRADES SO THAT INTERFERENCE BETWEEN PIPING, EQUIPMENT, STRUCTURAL, AND ELECTRICAL WORK WILL BE AVOIDED. ALL NECESSARY OFFSETS IN PIPING AND DUCTWORK, AND ALL FITTINGS, AND OTHER COMPONENTS, REQUIRED TO INSTALL THE WORK PROPERLY SHALL BE FURNISHED COMPLETE IN PLACE AT NO ADDITIONAL COST.
- B. IT IS REQUIRED THAT CONTRACTORS VISIT THE SITE OF THE WORK AND BECOME FAMILIAR WITH THE CONDITIONS AFFECTING THE INSTALLATION PRIOR TO BIDDING. SUBMISSION OF A BID SHALL PRESUPPOSE KNOWLEDGE OF SUCH CONDITIONS AND NO ADDITIONAL COMPENSATION SHALL BE ALLOWED WHERE EXTRA LABOR OR MATERIALS ARE REQUIRED BECAUSE OF THE LACK OF KNOWLEDGE OF THESE CONDITIONS.
- C. THE CONTRACTOR SHALL PRODUCE FULL COORDINATION DRAWINGS BETWEEN ALL TRADES IDENTIFYING ANY AREAS OF INTERFERENCE OR CLASHES PRIOR TO THE START OF CONSTRUCTION. MODIFICATIONS SHALL BE MADE TO THE ASSOCIATED SYSTEMS TO RESOLVE THE ISSUE IN COORDINATION WITH AND APPROVAL OF THE ARCHITECT AND ENGINEER.
- D. UNLESS OTHERWISE STIPULATED UNDER A PARTICULAR HEADING, THE FOLLOWING RULES RELATIVE TO RESPONSIBILITIES OF THE CONTRACTORS AND SUBCONTRACTORS WILL APPLY:
 - 1. COORDINATE MAKE-UP WATER PIPING CONNECTIONS WITH MECHANICAL.
 - 2. CEILING ACCESS PANELS WILL BE INSTALLED BY THE GENERAL CONTRACTOR AT LOCATIONS DETERMINED BY THE PLUMBING CONTRACTOR.
 - 3. THE PLUMBING CONTRACTOR OR SUBCONTRACTOR SHALL INSTALL ALL ROUGHING IN PERTAINING TO HIS TRADE FOR EACH ITEM OF EQUIPMENT FURNISHED UNDER ANOTHER SECTION OF THE SPECIFICATIONS OR BY THE OWNER.
 - 4. THE PLUMBING CONTRACTOR SHALL MAKE FINAL CONNECTIONS OF EQUIPMENT TO ROUGH INS.

1.04 DESIGN DRAWINGS

- A. THE CONTRACT DRAWINGS ARE DIAGRAMMATIC AND ARE NOT INTENDED TO SHOW EXACT LOCATION OF EQUIPMENT, PIPING AND DUCTWORK UNLESS DIMENSIONS ARE GIVEN. SYSTEMS AND DISTRIBUTION ARE TO BE INSTALLED ALONG THE GENERAL PLANS SHOWN ON THE DRAWINGS, BUT IN COORDINATION WITH ACTUAL FIELD CONDITIONS.

- B. EXTRA COSTS WHICH MIGHT RESULT FROM DEVIATIONS FROM THE DRAWINGS, SO AS TO AVOID INTERFERENCES, SHALL BE CONSIDERED A "JOB CONDITION", AND NO ADDITIONAL COMPENSATION WILL BE CONSIDERED APPLICABLE. IN THE EVENT THAT SUCH INTERFERENCES OCCUR IN THE COURSE OF THE WORK, DUE TO AN ERROR, OMISSION, OR OVERSIGHT BY THE CONTRACTOR, NO ADDITIONAL COMPENSATION SHALL BE ALLOWED. INTERFERENCES WHICH MAY OCCUR DURING THE COURSE OF CONSTRUCTION SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT, AND HIS/HER DECISION, CONFIRMED IN WRITING, SHALL BE FINAL.

1.05 MANUFACTURER SPECIFICATIONS

- A. EQUIPMENT SCHEDULED ON THE DRAWINGS WAS USED TO ARRIVE AT SPACE, MAINTENANCE, AND UTILITY SERVICE. IF OTHER EQUIPMENT IS SUBMITTED AND APPROVED, TAKE RESPONSIBILITY FOR MAINTAINING THESE SPACE, MAINTENANCE, AND UTILITY SERVICE REQUIREMENTS AND COST FOR ANY RESULTING CHANGES INCLUDING COST TO CHANGE ELECTRICAL SERVICE REQUIRED BY SUBSTITUTED EQUIPMENT.
- B. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND FIRST CLASS IN EVERY RESPECT. AS FAR AS IS PRACTICAL, SIMILAR PRODUCTS SHALL BE BY ONE MANUFACTURER.
- C. ALL PRODUCTS DESIGNED FOR DISPENSING POTABLE WATER MUST MEET BOTH THE NSF 61 AND NSF 372 TEST STANDARDS VIA THIRD-PARTY TESTING AND CERTIFICATION.

1.06 SUBMITTALS

- A. SUBMIT PRODUCT DATA FOR THE ARCHITECTS/ENGINEERS APPROVAL PRIOR TO PURCHASING AND INSTALLING THE FOLLOWING:
 - 1. ALL EQUIPMENT AND FIXTURES.
 - 2. PIPING.
 - 3. PIPING ACCESSORIES
 - 4. PIPING INSULATION.
- B. TEST REPORTS – PROVIDE PRESSURE TESTS, FLUSHING AND DISINFECTION, TEST OF BACKFLOW PREVENTION ASSEMBLIES.
- C. OPERATION AND MAINTENANCE DATA - INSTALLATION, OPERATION AND MAINTENANCE MANUALS OF ALL SPECIFIED EQUIPMENT, FIXTURES, PIPING, PIPING ACCESSORIES AND PIPING INSULATION. PROVIDE 2 BOOKS AND AN ELECTRONIC PDF COPY.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

- A. DOMESTIC WATER

1. ABOVE GROUND, 6 INCH AND SMALLER – ASTM B88, TYPE "L" HARD DRAWN SEAMLESS COPPER WITH WROUGHT COPPER SOLDER JOINT TYPE FITTINGS, ASTM B16.22. WHERE SILVER BRAZING ALLOY IS USED TO JOIN PIPE AND FITTINGS, FITTINGS TO BE SUITABLE FOR BRAZING.
 2. AS CONTRACTOR'S OPTION WITH OWNER PRE-APPROVAL ONLY: THE FOLLOWING PRESS-CONNECT FITTING SYSTEM MAY BE USED FOR ABOVE GROUND DOMESTIC HOT AND COLD WATER SYSTEMS (SIZES 1/2" TO 4") IN LIEU OF THE PIPE FITTINGS / JOINTS SPECIFIED ABOVE: COPPER PRESS FITTINGS SHALL CONFORM TO THE MATERIAL AND SIZING REQUIREMENTS OF ASME B16.18 OR ASME B16.22. O-RINGS FOR COPPER PRESS FITTINGS SHALL BE EPDM. MANUFACTURER: VIEGA PRO-PRESS OR ENGINEER APPROVED EQUAL.
 3. UNDERGROUND, 2 INCH AND SMALLER – ASTM B88, TYPE "K" SOFT COPPER TUBE WITH NO JOINTS BELOW THE FLOOR SLAB. COPPER PIPING INSTALLED BELOW GRADE SHALL BE PROTECTED BY A BITUMINOUS COATING. FITTINGS AND JOINTS SHALL BE WROUGHT COPPER SOLDER JOINT TYPE FITTINGS, ASTM B16.22. WHERE SILVER BRAZING ALLOY IS USED TO JOIN PIPE AND FITTINGS, FITTINGS TO BE SUITABLE FOR BRAZING.
 4. WATER SERVICE, UNDERGROUND EXTERIOR, 3 INCHES AND LARGER - AS REQUIRED BY THE SERVING UTILITY BUT NOT LESS THAN ANSI A21.51/AWWA C151 CEMENT MORTAR LINED (ANSI A21.4/AWWA C104) DUCTILE IRON PIPE. FURNISH WITH RUBBER GASKETED PUSH ON JOINTS (ANSI A21.1/AWWA C111).
- B. SANITARY SOIL AND WASTE PIPING BELOW GROUND TO 5'-0" OUTSIDE BUILDING WALLS
1. SERVICE WEIGHT CAST IRON, BELL AND SPIGOT, PIPE AND FITTINGS BY CHARLOTTE, TYLER, OR AB + I, ASTM A74, WITH CISPI "HSN" COMPRESSION TYPE GASKETS, ASTM C564, TYLER "TY-SEAL" OR EQUAL NEOPRENE PIPE GASKETS. ALL CAST IRON PIPE AND FITTINGS SHALL BE MADE IN THE UNITED STATES, MARKED WITH THE COLLECTIVE TRADEMARK OF CAST IRON SOIL PIPE INSTITUTE (CISPI) AND BE LISTED BY NSF INTERNATIONAL.
- C. SANITARY SOIL, WASTE, AND VENT PIPING ABOVE GROUND INTERIOR
1. SERVICE WEIGHT NO HUB CAST IRON PIPE AND FITTINGS, ASTM A888, CISPI-301, AS MANUFACTURED BY CHARLOTTE, TYLER, OR AB + I, JOINED WITH CISPI-310 HEAVY-DUTY CAST IRON NO-HUB NEOPRENE SLEEVE-STAINLESS STEEL TYPE 304 SHIELD AND CLAMP, 24-GAUGE WITH HI-TORQUE CLAMPS TIGHTENED TO 80 INCH-POUNDS. CLAMPS SHALL BE CLAMP-ALL HI-TORQUE 80 ANACO HUSKY HD2000. ALL CAST IRON PIPE AND FITTINGS SHALL BE MADE IN THE UNITED STATES, MARKED WITH THE COLLECTIVE TRADEMARK OF CAST IRON SOIL PIPE INSTITUTE (CISPI) AND BE LISTED BY NSF INTERNATIONAL.
- D. STORM DRAIN PIPING BELOW GROUND TO 5'-0" OUTSIDE BUILDING WALLS

1. SERVICE WEIGHT CAST IRON, BELL AND SPIGOT, PIPE AND FITTINGS BY CHARLOTTE, TYLER, OR AB + I, ASTM A74, WITH CISPI "HSN" COMPRESSION TYPE GASKETS, ASTM C564, TYLER "TY-SEAL" OR EQUAL NEOPRENE PIPE GASKETS. ALL CAST IRON PIPE AND FITTINGS SHALL BE MADE IN THE UNITED STATES, MARKED WITH THE COLLECTIVE TRADEMARK OF CAST IRON SOIL PIPE INSTITUTE (CISPI) AND BE LISTED BY NSF INTERNATIONAL.
 2. AS CONTRACTOR'S OPTION WITH OWNER PRE-APPROVAL ONLY: TYPE 1, SOLID WALL, DWV POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS (ASTM D2665), SCHEDULE 40.
- E. STORM DRAIN PIPING ABOVE GROUND INTERIOR (ABOVE GROUND INSIDE BUILDING AND INTERIOR STORM LEADER STACKS AND RAINWATER CONDUCTORS)
1. SERVICE WEIGHT NO HUB CAST IRON PIPE AND FITTINGS, ASTM A888, CISPI-301, AS MANUFACTURED BY CHARLOTTE, TYLER, OR AB + I, JOINED WITH CISPI-310 HEAVY-DUTY CAST IRON NO-HUB NEOPRENE SLEEVE-STAINLESS STEEL TYPE 304 SHIELD AND CLAMP, 24-GAUGE WITH HI-TORQUE CLAMPS TIGHTENED TO 80 INCH-POUNDS. CLAMPS SHALL BE CLAMP-ALL HI-TORQUE 80 ANACO HUSKY HD2000.
 2. AS CONTRACTOR'S OPTION WITH OWNER PRE-APPROVAL ONLY: TYPE 1, SOLID WALL, DWV POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS (ASTM D2665), SCHEDULE 40. PVC PIPE AND FITTINGS SHALL NOT BE INSTALLED WITHIN RETURN AIR PLENUMS.
- F. PVC PIPE AND FITTINGS SHALL NOT BE INSTALLED WITHIN RETURN AIR PLENUMS.
- G. CELLULAR CORE (FOAM CORE) PIPE AND FITTINGS ARE NOT ACCEPTABLE.
- H. TRAP PRIMER FEED PIPING - TYPE "K" SOFT COPPER WITHOUT JOINTS (ASTM B88) FOR ELEVATED FLOORS WITH DRAINS AND CROSS-LINKED POLYETHYLENE (PEX) PLASTIC TUBING (ASTM F 877) FOR SLAB ON GRADE WITH DRAINS.
- 2.02 PIPE JOINTS
- A. JOINTS FOR COPPER PIPE - SOLDER JOINT TYPE ASTM B16.22. WHERE SILVER BRAZING ALLOY IS USED TO JOIN PIPE AND FITTINGS, FITTINGS TO BE SUITABLE FOR BRAZING. SWEAT SOLDER JOINTS IN COPPER DOMESTIC WATER PIPING SYSTEMS THAT HAVE AN INTERNAL PRESSURE OF 125 PSIG OR LESS WITH A 95-5 LEAD-FREE SOLDER. JOINTS SHALL BE MADE SO THAT THE SOLDER RING IS VISIBLE COMPLETELY AROUND THE JOINT. NO ACID-CORE FLUX SHALL BE USED.
 - B. JOINTS FOR WATER SERVICE PIPING, UNDERGROUND, EXTERIOR - PUSH ON JOINTS WITH RUBBER GASKET MEETING ANSI A21.11/AWWA C111.
 - C. JOINTS FOR USE WITH STEEL GAS PIPING – THREADED FOR PIPING 2" AND SMALLER, WELDED FOR PIPING 2-1/2" AND LARGER. GAS PIPING LOCATED BELOW GROUND, OR FOR GAS DISTRIBUTION PRESSURES GREATER THAN 5 PSI SHALL BE WELDED.

- D. CAST IRON, HUBLESS - HEAVY-DUTY CAST IRON NO-HUB NEOPRENE SLEEVE-STAINLESS STEEL TYPE 304 SHIELD AND CLAMP, 24-GAUGE WITH HI-TORQUE CLAMPS TIGHTENED TO 80 INCH-POUNDS. CLAMPS SHALL BE CLAMP-ALL HI-TORQUE 80 ANACO HUSKY HD2000.
- E. CAST IRON, HUB AND SPIGOT - CISPI HSN COMPRESSION TYPE WITH ASTM C564 NEOPRENE GASKETS, OR LEAD AND OAKUM.
- F. PVC DRAINAGE, WASTE AND VENT – SOLVENT WELD, LOW V.O.C. PRIMER AND CEMENT (ASTM D2564)
- G. CPVC, DOMESTIC WATER AND CONDENSATE – SOLVENT WELD, LOW V.O.C. PRIMER AND CEMENT (ASTM F493/ASTM D2846).

2.03 VALVES

- A. ALL VALVES MAY NOT BE SHOWN IN EVERY INSTANCE ON THE DRAWINGS, BUT WHETHER OR NOT SHOWN, ALL VALVES NECESSARY FOR THE PROPER INSTALLATION OF THE SYSTEM SHALL BE INSTALLED BY THE PLUMBING CONTRACTOR.
- B. ALL VALVES FOR USE WITH THE DOMESTIC WATER SYSTEMS SHALL BE CERTIFIED AS LEAD-FREE AND MUST MEET BOTH THE NSF 61 AND NSF 372 TEST STANDARDS VIA THIRD PARTY TESTING AND CERTIFICATION.
- C. PLASTIC VALVES ARE NOT ACCEPTABLE.
- D. INSTALL ALL VALVES WITH THE STEMS OR SPINDLE ABOVE THE HORIZONTAL WHERE POSSIBLE AND DO NOT INSTALL VALVES OVER ELECTRICAL PANELS OR EQUIPMENT.
- E. PROVIDE EXTENDED VALVE STEMS ON INSULATED PIPE.
- F. LOCATE SHUTOFF VALVES AT ALL AUTOMATIC VALVES, CHECK VALVES, AT ALL EQUIPMENT SO THEY CAN BE ISOLATED FOR REPAIRS, AT ALL BRANCH LINES CONNECTING TO MAINS, AND ELSEWHERE AS SHOWN ON THE DRAWINGS. LOCATE CHECK VALVES ON THE DISCHARGE SIDE OF ALL PUMPS AND ELSEWHERE AS SHOWN ON THE DRAWINGS.
- G. PROVIDE ALL VALVES OF THE SAME MANUFACTURER WHERE POSSIBLE. MANUFACTURERS: APOLLO, MILWAUKEE, NIBCO, HAMMOND, OR WATTS. ALL VALVES TO BE OF DOMESTIC MANUFACTURE:
 - 1. VALVES IN WATER PIPING 2 INCHES AND SMALLER: TWO-PIECE BALL VALVES WITH BRONZE BODY, TEFLON SEATS, FULL PORT, BLOW-OUT PROOF STEM, ADJUSTABLE PACKING GLAND, CHROME PLATED SOLID BRONZE OR STAINLESS-STEEL BALL, SOLDERED OR THREADED ENDS, MINIMUM 150 PSI SWP / 600 PSI WOG RATING AND COMPLY WITH MSS SP-110.
 - 2. VALVES IN WATER PIPING SYSTEMS WITH PRESSURE-SEAL-JOINT FITTINGS (PROPRESS), PRESS-END VALVES BY VIEGA OR ENGINEER APPROVED EQUAL WITH THE SAME CHARACTERISTICS AS THE STANDARD VALVES LISTED ABOVE SHALL BE UTILIZED.

3. OPERATORS: ON-OFF THROTTLING LEVER HANDLES ON SIZES 2-1/2 INCHES TO 6 INCHES, TOTALLY ENCLOSED WORM GEAR OR ACME SCREW OPERATORS WITH HAND WHEEL ON SIZES 8 INCHES TO 20 INCHES. EQUIP VALVES USED FOR BALANCING WITH MEMORY STOP. INSTALL CHAINWHEELS ON OPERATORS FOR GATE VALVES NPS 4 AND LARGER AND MORE THAN 96 INCHES ABOVE FLOOR. EXTEND CHAINS TO 60 INCHES ABOVE FINISHED FLOOR.
 4. HORIZONTAL CHECK VALVES 2 INCHES AND SMALLER: SWING TYPE DESIGN, CLASS 125, 200 WOG, WITH BRONZE BODY AND CAP WITH THREADED OR SOLDERED ENDS. CONFORM TO ASTM B62.
 5. VERTICAL CHECK VALVES 2 INCHES AND SMALLER: 250 WOG, CENTER GUIDED, SILENT, NON-SLAM TYPE. BRONZE BODY, SPRING, AND DISC HOLDER, THREADED ENDS. METRAFLEX 700.
 6. VALVES FOR USE IN GROOVED PIPING SYSTEMS: REFER TO GROOVED PIPING SYSTEM SPECIFICATION.
- H. STRAINERS:
1. 2 INCHES AND SMALLER: 'Y' TYPE PIPELINE STRAINER, BRASS OR BRONZE BODY, THREADED ENDS, 304 STAINLESS STEEL SCREEN WITH 20 MESH OPENINGS, 400 PSIG AT 210 DEGREE F. COMPLETE WITH SOLID RETAINER CAP AND GASKET. WATTS SERIES LF777 OR EQUIVALENT BY CLA-VAL, CONBRACO, FEBCO, OR WILKINS.
- I. UNIONS:
1. UNIONS IN STEEL PIPING 2 INCHES AND SMALLER: MALLEABLE IRON, GROUND JOINT BRASS TO IRON SEAT SUITABLE FOR 175 PSI WORKING PRESSURES.
 2. UNIONS IN COPPER PIPING 2 INCHES AND SMALLER, CAST BRASS SOLDER FITTINGS WITH MACHINED AND LAPPED SEATS SUITABLE FOR 175 PSI WORKING PRESSURES.
 3. WHERE GROOVED JOINT PIPING SYSTEMS ARE UTILIZED, UNIONS ARE NOT REQUIRED. COUPLINGS SHALL SERVE AS UNIONS.
- J. DIELECTRIC CONNECTIONS: PROVIDE AT CONNECTIONS BETWEEN COPPER AND FERROUS METAL PIPING MATERIALS IN DOMESTIC COLD WATER SYSTEMS ASTM F441, SCHEDULE 80, CPVC THREADED PIPE NIPPLES, 4 INCHES MINIMUM LENGTH. PROVIDE FOR DIELECTRIC CONNECTIONS IN PIPE SIZES 2 INCHES AND SMALLER. PROVIDE AT CONNECTIONS BETWEEN COPPER AND FERROUS PIPING IN DOMESTIC HOT WATER SYSTEMS VICTAULIC CLEARFLOW DIELECTRIC WATERWAY STYLE 47. FITTING CONSISTS OF ZINC PLATED CASING WITH A CHEMICALLY INERT NSF/FDA LISTED DIELECTRIC THERMOPLASTIC LINING.
- K. WATER HAMMER ARRESTORS: BELLOWS TYPE, WITH STAINLESS STEEL CASING AND BELLOWS, TESTED AND CERTIFIED IN ACCORDANCE WITH PDI STANDARD WH-201. PROVIDE A PRESSURE REDUCING VALVE ON THE INLET TO THE DEVICE WHERE SYSTEM PRESSURES ARE ABOVE 80PSI. MANUFACTURER: JAY R. SMITH. OTHER ACCEPTABLE MANUFACTURERS ARE: JOSAM, WADE, AND ZURN.

- L. EXPANSION COMPENSATORS - EXC-1: FOR COPPER PIPE 2 INCHES AND SMALLER. CONSTRUCTED OF A MULTI-PLY STAINLESS STEEL BELLOWS WITH CARBON STEEL SHROUD WITH AN INTERNAL, POSITIVE, ANTI-TORQUE DEVICE. SOLDER JOINTS. MAXIMUM WORKING PRESSURE: 150 PSIG. MAXIMUM OPERATING TEMPERATURE: 500 DEGREES F. MAXIMUM STROKE: 1-3/4 INCH. METRAFLEX MODEL HPFF OR EQUIVALENT BY KEFLEX OR FLEXONICS.
- M. FLEXIBLE CONNECTORS: FLEXIBLE CONNECTORS SHALL BE PROVIDED AT THE SUCTION AND DISCHARGE OF EACH PUMP THAT IS 1 HP OR LARGER. CONNECTORS SHALL BE CONSTRUCTED OF NEOPRENE, RUBBER, OR BRAIDED BRONZE, WITH CLASS 150 STANDARD FLANGES. FLEXIBLE CONNECTORS SHALL BE LINE SIZE AND SUITABLE FOR THE PRESSURE AND TEMPERATURE OF THE INTENDED SERVICE.
- N. PIPE GUIDES - GUIDES CONSISTING OF STEEL SEGMENTED SPIDER SIZED TO THE OUTSIDE DIAMETER OF THE PIPE OR INSULATION AND FREE TO MOVE AXIALLY AT THE SEGMENTED STEEL CYLINDER. PROVIDE A MINIMUM OF 2 GUIDES ON EACH SIDE OF EXPANSION COMPENSATORS OR EXPANSION JOINTS AND ELSEWHERE AS INDICATED. PROVIDE GUIDES OF LENGTH RECOMMENDED BY MANUFACTURER TO ALLOW REQUIRED TRAVEL. METRAFLEX OR EQUIVALENT BY KEFLEX, FEE AND MASON OR FLEXONICS.
- O. PIPE ANCHORS - INSTALL IN CONJUNCTION WITH GUIDES.

2.04 PIPE HANGERS AND SUPPORTS

- A. PROVIDE MSS SP-58 AND MSS SP-69, TYPE 1 WITH ADJUSTABLE TYPE STEEL SUPPORT RODS, EXCEPT AS SPECIFIED OR INDICATED OTHERWISE.
- B. ATTACH TO STEEL JOISTS WITH TYPE 19 OR 23 CLAMPS AND RETAINING STRAPS. ATTACH TO STEEL W OR S BEAMS WITH TYPE 21, 28, 29, OR 30 CLAMPS.
- C. ATTACH TO STEEL ANGLES AND VERTICAL WEB STEEL CHANNELS WITH TYPE 20 CLAMP WITH BEAM CLAMP CHANNEL ADAPTER.
- D. ATTACH TO HORIZONTAL WEB STEEL CHANNEL AND WOOD WITH DRILLED HOLE ON CENTERLINE AND DOUBLE NUT AND WASHER.
- E. ATTACH TO CONCRETE WITH TYPE 18 INSERT OR DRILLED EXPANSION ANCHOR.
- F. PROVIDE TYPE 40 INSULATION PROTECTION SHIELD FOR INSULATED PIPING.
- G. PROVIDE HANGERS AND SUPPORTS BY ANVIL INTERNATIONAL, COOPER B-LINE OR GRINNELL:
 - 1. SPLIT RING HANGERS – CARBON STEEL WITH ADJUSTABLE SWIVEL.
 - 2. CLEVIS HANGERS - CARBON STEEL WITH ADJUSTABLE SWIVEL.
 - 3. MULTIPLE OR TRAPEZE HANGERS – STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS. PROVIDE CAST IRON ROLL FOR PIPE SIZES 6 INCH AND LARGER.
 - 4. VERTICAL PIPE SUPPORTS - STEEL RISER CLAMP.
- H. USE OF "C" CLAMPS AND BEAM CLAMPS OF "C" PATTERN AND ANY MODIFICATIONS THEROF ARE PROHITED FOR ALL PIPE SIZES 6" AND GREATER.

1. "C" CLAMPS USED FOR PIPE SIZES 3" AND 4" MUST BE INSTALLED WITH BEAM CLAMP RETAINING STRAPS WITH A MINIMUM OF 1" OF STRAP TO BE BENT OVER THE BEAM SIDE OF THE FLANGE OPPOSITE THE SIDE THE BEAM CLAMP IS MOUNTED ON.
 2. PROVIDE "C" CLAMPS IWTH HARDENED STEEL CUP-POINT SET SCREWS AND LOCK-NUTS FOR ANCHORING IN PLACE.
- I. PROVIDE RUBBER COATED, PLASTIC, OR EPOXY COATED HANGERS AND SUPPORTS FOR COPPER PIPING. COPPER COATED, PLATED OR COLORED HANGERS AND SUPPORTS ARE *NOT* ACCEPTABLE.
- J. MAKESHIFT, FIELD DEVISED METHODS OF PLUMBING PIPE POSITIONING AND SUPPORTS, SUCH AS WITH THE USE OF SCRAP FRAMING MATERIALS, ARE NOT ALLOWED.
- 2.05 GAUGES
- A. PRESSURE AND VACUUM INDICATING DIAL TYPE - ELASTIC ELEMENT: ASME B40.100.
- 2.06 THERMOMETERS
- A. DIRECT-MOUNTED, METAL CASE, VAPOR ACTUATED THERMOMETERS: ASME B40.200. MERCURY SHALL NOT BE USED IN THERMOMETERS.
- 2.07 PIPE INSULATION MATERIAL
- A. ACCEPTABLE MANUFACTURERS: OWENS-CORNING, KNAUF, CERTAINTEED, PITTSBURGH-CORNING.
- B. INSULATION SCHEDULE:
1. DOMESTIC HOT WATER AND HOT WATER RECIRCULATING PIPING SHALL BE INSULATED WITH 1 INCH THICK INSULATION FOR PIPE SIZES 1-1/4 INCHES AND SMALLER, 1-1/2 INCH THICK FOR PIPE SIZES 1-1/2 INCHES AND LARGER.
 2. COLD WATER PIPING SHALL BE INSULATED WITH 1 INCH THICK INSULATION.
 3. ROOF DRAIN BODIES AND ALL ABOVE GROUND HORIZONTAL AND VERTICAL PRIMARY AND OVERFLOW ROOF DRAIN PIPING SHALL BE INSULATED WITH 1 INCH THICK INSULATION.
- C. INSULATION FOR PIPING INSTALLED IN "DRY" LOCATIONS SHALL BE GLASS FIBER NON-COMBUSTIBLE PREFORMED INSULATION, ASTM C547 WITH A "K" VALUE OF 0.23" AT 75°F AND FACTORY APPLIED VAPOR BARRIER JACKET. VAPOR BARRIER JACKETS SHALL BE KRAFT REINFORCED WHITE VAPOR BARRIER WITH SELF-SEALING ADHESIVE JOINTS.

- D. INSULATION FOR PIPING RECEIVING CHILLED WATER/COOLING COIL CONDENSATE WASTE, PIPING INSTALLED WITHIN MECHANICAL AND BOILER ROOMS, AND PIPING INSTALLED IN "WET" LOCATIONS SHALL BE PRE-FORMED FLAME RETARDANT ELASTOMERIC POLYETHYLENE SIMILAR TO AP ARMAFLEX, ARMAFLEX SS, IMCOA IMOLOCK OR NOMACO NOMALOCK.
- E. INSTALL INSULATION ON PIPE SYSTEMS SUBSEQUENT TO TESTING AND ACCEPTANCE OF TESTS.
- F. COVER VALVES, FITTINGS AND SIMILAR ITEMS IN EACH PIPING SYSTEM WITH EQUIVALENT THICKNESS AND COMPOSITION OF INSULATION AS APPLIED TO ADJOINING PIPE RUN. PROVIDE FACTORY MOLDED, ONE AND TWO PIECE PRE-MOLDED HIGH IMPACT PVC FITTING COVERS WITH FIBERGLASS INSERTS AND ACCESSORIES FOR ELBOWS, TEES, END CAPS, COUPLINGS, TACK FASTENERS & TAPES.
- G. EXPOSED SANITARY DRAINS, DOMESTIC WATER, DOMESTIC HOT WATER, AND STOPS AT LAVATORIES SHALL BE INSULATED AND FINISHED WITH TRUEBRO MODEL NO. 102 "LAV-GUARD" OR BROCAR "TRAP-WRAP" WHITE INSULATION KIT.
- H. NO STAPLES SHALL BE PERMITTED FOR INSTALLATION OF INSULATION.
- I. PROVIDE INSULATION SHIELDS AT HANGERS.
- J. ALL PIPING SHALL BE SUPPORTED IN SUCH A MANNER THAT NEITHER THE INSULATION NOR THE VAPOR/WEATHER BARRIER IS COMPROMISED BY THE HANGER OR THE EFFECTS OF THE HANGER. HANGER SPACING SHALL BE SUCH THAT THE JOINTS MAY BE MADE OUTSIDE THE HANGER AREA. THE VAPOR BARRIER SHALL BE CONTINUOUS. PROVIDE SUPPORT SADDLES.
- K. ALL INSULATION MATERIALS SHALL COMPLY WITH ASTM E-84 WITH A FLAME SPREAD INDEX OF 0-25 AND A SMOKE DEVELOPED INDEX OF 0-50.

2.08 ACCESS DOORS

- A. PROVIDE ACCESS DOORS AT CIRCULATION PUMPS, VALVES, TRAPS PRIMERS, AIR VENTS, SHOCK ABSORBERS, AND THE LIKE ITEMS REQUIRING ADJUSTMENT OR MAINTENANCE ACCESSIBILITY IF THEY CANNOT BE LOCATED OVER LAY-IN TYPE CEILINGS OR CANNOT BE ACCESSIBLE FROM ATTICS OR MECHANICAL ROOMS. OBTAIN APPROVAL FROM THE ARCHITECT FOR LOCATION OF ACCESS DOORS. PROVIDE VISIBLE MARKERS FOR ACCESS DOORS IN CONCEALED LOCATIONS.
- B. ACCESS DOORS SHALL BE AS SIMILAR TO THOSE MANUFACTURED BY MILCOR DIVISION OF INLAND-RYERSON OF TYPE AS FOLLOWS:
 - 1. DRYWALL: STYLE "DW"
 - 2. MASONRY OR TILE: STYLE "M-STAINLESS"
 - 3. ACOUSTICAL TILE: STYLE "AT"
 - 4. PLASTER: STYLE "K"
 - 5. FIRE RATED WALL/CEILINGS: STYLE "FIRE RATED"

- C. EACH DOOR SHALL BE EQUIPPED WITH TWO FLUSH, SCREWDRIVER OPERATED, CAM LATCHES AND, OTHER THAN STYLE "M", SHALL BE FINISHED TO MATCH ADJACENT SURFACE. PROVIDE ACCESS DOORS IN AREAS SUBJECT TO VANDALISM WITH VANDAL-PROOF LOCKS. DOOR SIZES SHALL BE APPLICABLE TO ACCESS REQUIRED FOR NORMAL SERVICE.

2.09 FLOOR, CEILING, AND WALL PLATES

- A. FIT ALL PIPES PASSING EXPOSED THROUGH WALLS, FLOORS, OR CEILINGS IN FINISHED ROOMS WITH STEEL OR BRASS ESCUTCHEONS. WHERE SURFACE IS TO RECEIVE A PAINT FINISH MAKE ESCUTCHEONS PRIME PAINTED; OTHERWISE MAKE ESCUTCHEONS NICKEL OR CHROME PLATED. WHERE PIPING IS INSULATED, FIT ESCUTCHEONS OUTSIDE INSULATION.

2.10 EQUIPMENT PADS

- A. EXCEPT WHERE OTHERWISE NOTED, PROVIDE PADS FOR ALL FLOOR MOUNTED EQUIPMENT INSTALLED UNDER THIS DIVISION. MAKE ALL EQUIPMENT PADS A MINIMUM OF 4 INCHES THICK. CONSTRUCT EQUIPMENT PADS OF 5000 POUND CONCRETE COMPLETE WITH ALL NECESSARY ANCHOR BOLTS, SLEEVES ANCHOR PLATES, WASHERS AND NUTS. SMOOTH ALL EXPOSED PORTIONS OF PADS AND BEVEL CORNERS.

2.11 SLEEVES

- A. WHERE PIPES PASS THROUGH MASONRY OR CONCRETE WALLS, SET MACHINE CUT STEEL PIPE SLEEVES 1 INCH LARGER THAN OUTSIDE DIAMETER OF PIPE, WITH ENDS OF SLEEVES FLUSH WITH WALL FACES. SLEEVES IN PARTITIONS OTHER THAN MASONRY OR CONCRETE WHERE FIRESTOPPING IS REQUIRED: 28 GAGE GALVANIZED STEEL SHEET. WHERE PIPES PASS THROUGH FLOORS, SET SCHEDULE 40 GALVANIZED STEEL PIPE SLEEVES 1 INCH LARGER THAN THE OUTSIDE DIAMETER OF THE PIPE. TOP OF SLEEVE TO BE 4 INCHES ABOVE FINISHED FLOOR IN MACHINE ROOMS AND WET FLOOR LOCATIONS. WHERE PIPES ARE INSULATED, PROVIDE SLEEVES LARGE ENOUGH TO ALLOW INSULATION TO PASS THROUGH SLEEVE. CENTER PIPES IN SLEEVES. PROVIDE FIRE STOPPING BETWEEN PIPE AND SLEEVE OR OPENING AS REQUIRED TO MAINTAIN THE INTEGRITY OF THE FIRE RATING OF ALL WALLS AND FLOORS. FIRE STOPPING PRODUCTS SHALL BE MANUFACTURED BY SPECIFIED TECHNOLOGIES, INC. (STI) AND INSTALLED BY A UL QUALIFIED FIRESTOP CONTRACTOR THAT HAS ALSO COMPLETED THE "CLEVELAND CLINIC FIRESTOP TRAINING CLASS". WHERE PIPES PASS THROUGH EXTERIOR WALLS BELOW GRADE, SET SCHEDULE 40 STEEL PIPE OR MANUFACTURED CASTINGS OR SLEEVES 1-1/2 INCH LARGER THAN THE OUTSIDE DIAMETER OF THE PIPE. MAKE THE PIPE TO WALL PENETRATION CLOSURE WITH "LINK-SEAL" AS MANUFACTURED BY THE THUNDERLINE CORP. OR METRASEAL.

B. ESCUTCHEON PLATES

1. PROVIDE ONE PIECE OR SPLIT HINGE METAL PLATES FOR PIPING ENTERING FLOORS, WALLS, AND CEILINGS IN EXPOSED SPACES. PROVIDE CHROMIUM-PLATED OR COPPER ALLOY PLATES OR POLISHED STAINLESS-STEEL FINISH IN FINISHED SPACES. PROVIDE PAINT FINISH ON PLATES IN UNFINISHED SPACES.

C. PLUMBING IDENTIFICATION

1. PIPE LABEL COLOR-CODING AND IDENTIFICATIONS SHALL BE IN ACCORDANCE WITH THE LOCAL AUTHORITY HAVING JURISDICTION AND ANSI/ASME A13.1.
2. NAMEPLATES- PROVIDE 0.125 INCH THICK MELAMINE LAMINATED PLASTIC NAMEPLATES, BLACK MATTE FINISH WITH WHITE CENTER CORE, FOR EQUIPMENT, GAGES, THERMOMETERS, AND VALVES; VALVES IN SUPPLIES TO FAUCETS WILL NOT REQUIRE NAMEPLATES. KEY NAMEPLATES TO A CHART AND SCHEDULE FOR EACH SYSTEM. FRAME CHARTS AND SCHEDULES UNDER GLASS AND PLACE WHERE DIRECTED NEAR EACH SYSTEM. FURNISH TWO COPIES OF EACH CHART AND SCHEDULE.
3. SELF-ADHESIVE PIPE LABELS: PRINTED PLASTIC WITH CONTACT- TYPE, PERMANENT-ADHESIVE BACKING. PIPE LABEL CONTENTS: INCLUDE IDENTIFICATION OF PIPING SERVICE USING SAME DESIGNATIONS OR ABBREVIATIONS AS USED ON DRAWINGS, PIPE SIZE, AND AN ARROW INDICATING FLOW DIRECTION.
4. PROVIDE WARNING LABELS STATING "CAUTION: NON-POTABLE WATER. DO NOT DRINK" ON ALL NON-POTABLE WATER PIPING AFTER IT HAS BEEN INSULATED.
5. APPROVED MANUFACTURERS ARE: CRAFTMARK IDENTIFICATION SYSTEMS, SAFETY SIGN CO., SETON IDENTIFICATION PRODUCTS.

PART 3 EXECUTION

3.01 PIPING GENERAL

- A. EXCAVATION, BACKFILLING, AND DE-WATERING THAT ARE INCIDENTAL TO THE PLUMBING WORK SHALL BE PERFORMED BY THE PLUMBING CONTRACTOR. THE UNDERGROUND INSTALLATION MUST BE INSPECTED AND APPROVED BY THE BUILDING DEPARTMENT INSPECTOR AND ARCHITECT PRIOR TO BACKFILLING AND TAMPING. CARE SHOULD BE EXERCISED IN PREPARING THE BOTTOM OF THE TRENCH TO ACCEPT THE PIPING AND IT SHOULD BE UNIFORMLY TAMPED AND BE FREE FROM HIGH SPOTS.
- B. ALL PIPING SHALL BE RUN STRAIGHT, PLUMB AND GRADED IN THE DIRECTION INDICATED ON THE PLANS. ALL CUT PIPE SHALL BE SQUARELY CUT WITH A NON-CHIP FORMING PROCESS WHERE POSSIBLE. THE CUT SHALL BE PROPERLY REAMED TO REMOVE ALL CONSTRUCTION AND BURRS BEFORE MAKING THE JOINT. ALL EXPOSED THREADS SHALL BE PAINTED OR OTHERWISE COATED TO STOP CORROSION.

- C. PITCH ALL 2-1/2" AND SMALLER DRAINAGE PIPING AT 1/4" PER FOOT MINIMUM AND 3" AND LARGER DRAINAGE PIPING AT 1/8" PER FOOT MINIMUM UNLESS OTHERWISE NOTED.
- D. ALL PIPING PENETRATING RATED FLOORS AND WALLS SHALL BE SEALED TO MAINTAIN FIRE RATING AND INTEGRITY OF SEPARATION. WHERE PIPES PASS THROUGH FIRE WALLS, FIRE- PARTITIONS, FIRE-RATED PIPE CHASE WALLS OR FLOORS ABOVE GRADE, A FIRE SEAL SHALL BE PROVIDED. REFER TO ARCHITECTURAL DRAWINGS FOR ALL FIRE STOPPING INFORMATION AND DETAILS RELATING TO PLUMBING PENETRATIONS INTO OR THROUGH FIRE RATED ASSEMBLIES.

3.02 EXCAVATION, BACKFILLING AND PUMPING

- A. EXCAVATE, BACKFILL AND COMPACT ALL TRENCHES REQUIRED FOR UNDERGROUND PLUMBING WORK. MAINTAIN TRENCHES FREE OF WATER UNTIL INSTALLATION IS COMPLETE AND PROVIDE ALL NECESSARY SHORING.
- B. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING UNDERGROUND UTILITIES AND AVOID DAMAGE TO SAME. WHERE EXISTING UTILITIES ARE DAMAGED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REPAIRS OR REPLACEMENT.
- C. EXCAVATE TRENCHES SUITABLE IN WIDTH TO PROVIDE MINIMUM OF 6" CLEAR SPACE BETWEEN THE BARREL OF THE PIPE AND THE TRENCH WALL ON BOTH SIDES OF THE PIPE. ACCURATELY GRADE THE TRENCH BOTTOM TO PROVIDE UNIFORM BEARING AND SUPPORT FOR EACH SECTION OF THE PIPE ON UNDISTURBED SOIL AT EVERY POINT ALONG IT'S ENTIRE LENGTH. TAKE CARE NOT TO EXCAVATE BELOW THE DEPTH NECESSARY AND EXCAVATE BELL HOLES TO ENSURE PROPER BEDDING. BACKFILL OVER DEPTHS WITH LOOSE, GRANULAR, MOIST MATERIAL AND THOROUGHLY COMPACT TO THE DEPTH REQUIRED. COMPACT TO 95 PERCENT OF THE MAXIMUM DENSITY BASED ON MODIFIED PROCTOR DENSITY CRITERIA.
- D. PLACE AND COMPACT BACKFILL MATERIAL IN 6" LAYERS UNTIL THE PIPE HAS A MINIMUM COVER OF 12". PLACE AND COMPACT THE REMAINING MATERIAL IN 12" LAYERS. GRADE THE SURFACE TO A REASONABLE UNIFORMITY AND LEAVE THE MOUNDING IN NEAT CONDITION AS APPROVED BY THE ARCHITECT.
- E. BACKFILL ALL TRENCHES PASSING UNDER FOUNDATIONS WITH CONCRETE TO THE UNDERSIDE OF THE FOUNDATION AND AT A 2:1 SLOPE AWAY FROM EACH SIDE OF THE FOUNDATION. BACKFILL ALL TRENCHES THAT ARE PARALLEL AND DEEPER THAN FOUNDATIONS WITH CONCRETE TO A POINT THAT WILL PLACE THE TOP OF THE CONCRETE ON A 2:1 SLOPE AWAY FROM THE FOUNDATION BOTTOM. DO NOT BACKFILL TRENCHES UNTIL ALL REQUIRED TESTS AND INSPECTIONS ARE COMPLETED.
- F. WHERE TRENCH WALLS ARE BELOW THE WATER TABLE, THE CONTRACTOR SHALL TAKE ALL MEASURES TO ENSURE TRENCH WALLS REMAIN STABLE, INCLUDING ALL DE-WATERING.

3.03 GENERAL

- A. THE PIPING SHALL BE EXTENDED TO FIXTURES, OUTLETS, AND EQUIPMENT. THE HOT-WATER AND COLD-WATER PIPING SYSTEM SHALL BE ARRANGED AND INSTALLED TO PERMIT DRAINING. THE SUPPLY LINE TO EACH ITEM OF EQUIPMENT OR FIXTURE, EXCEPT FAUCETS, FLUSH VALVES, OR OTHER CONTROL VALVES WHICH ARE SUPPLIED WITH INTEGRAL STOPS, SHALL BE EQUIPPED WITH A SHUTOFF VALVE TO ENABLE ISOLATION OF THE ITEM FOR REPAIR AND MAINTENANCE WITHOUT INTERFERING WITH OPERATION OF OTHER EQUIPMENT OR FIXTURES. SUPPLY PIPING TO FIXTURES, FAUCETS, HYDRANTS, SHOWER HEADS, AND FLUSHING DEVICES SHALL BE ANCHORED TO PREVENT MOVEMENT.
- B. THE WORK SHALL BE CAREFULLY LAID OUT IN ADVANCE, AND UNNECESSARY CUTTING OF CONSTRUCTION SHALL BE AVOIDED. DAMAGE TO BUILDING, PIPING, WIRING, OR EQUIPMENT AS A RESULT OF CUTTING SHALL BE REPAIRED BY MECHANICS SKILLED IN THE TRADE INVOLVED.
- C. PIPE OPENINGS SHALL BE CLOSED WITH CAPS OR PLUGS DURING INSTALLATION. FIXTURES AND EQUIPMENT SHALL BE TIGHTLY COVERED AND PROTECTED AGAINST DIRT, WATER, CHEMICALS, AND MECHANICAL INJURY. UPON COMPLETION OF THE WORK, THE FIXTURES, MATERIALS, AND EQUIPMENT SHALL BE THOROUGHLY CLEANED, ADJUSTED, AND OPERATED. SAFETY GUARDS SHALL BE PROVIDED FOR EXPOSED ROTATING EQUIPMENT.
- D. PIPING SHALL BE INSTALLED AS INDICATED. PIPE SHALL BE ACCURATELY CUT AND WORKED INTO PLACE WITHOUT SPRINGING OR FORCING. STRUCTURAL PORTIONS OF THE BUILDING SHALL NOT BE WEAKENED. ABOVEGROUND PIPING SHALL RUN PARALLEL WITH THE LINES OF THE BUILDING, UNLESS OTHERWISE INDICATED. BRANCH PIPES FROM SERVICE LINES MAY BE TAKEN FROM TOP, BOTTOM, OR SIDE OF MAIN, USING CROSSOVER FITTINGS REQUIRED BY STRUCTURAL OR INSTALLATION CONDITIONS.
- E. SUPPLY PIPES, VALVES, AND FITTINGS SHALL BE KEPT A SUFFICIENT DISTANCE FROM OTHER WORK AND OTHER SERVICES TO PERMIT NOT LESS THAN 1/2 INCH BETWEEN FINISHED COVERING ON THE DIFFERENT SERVICES. BARE AND INSULATED WATER LINES SHALL NOT BEAR DIRECTLY AGAINST BUILDING STRUCTURAL ELEMENTS SO AS TO TRANSMIT SOUND TO THE STRUCTURE OR TO PREVENT FLEXIBLE MOVEMENT OF THE LINES. WATER PIPE SHALL NOT BE BURIED IN OR UNDER FLOORS UNLESS SPECIFICALLY INDICATED OR APPROVED. CHANGES IN PIPE SIZES SHALL BE MADE WITH REDUCING FITTINGS. USE OF BUSHINGS WILL NOT BE PERMITTED EXCEPT FOR USE IN SITUATIONS IN WHICH STANDARD FACTORY FABRICATED COMPONENTS ARE FURNISHED TO ACCOMMODATE SPECIFIC ACCEPTED INSTALLATION PRACTICE. CHANGE IN DIRECTION SHALL BE MADE WITH FITTINGS.
- F. PIPE DRAINS INDICATED SHALL CONSIST OF 3/4 INCH HOSE BIBB WITH RENEWABLE SEAT AND BALL VALVE AHEAD OF HOSE BIBB. AT OTHER LOW POINTS, 3/4 INCH BRASS PLUGS OR CAPS SHALL BE PROVIDED. DISCONNECTION OF THE SUPPLY PIPING AT THE FIXTURE IS AN ACCEPTABLE DRAIN.

- G. ALLOWANCE SHALL BE MADE THROUGHOUT FOR EXPANSION AND CONTRACTION OF WATER PIPE. BRANCH CONNECTIONS FROM RISERS SHALL BE MADE WITH AMPLE SWING OR OFFSET TO AVOID UNDUE STRAIN ON FITTINGS OR SHORT PIPE LENGTHS. HORIZONTAL RUNS OF PIPE OVER 50 FEET IN LENGTH SHALL BE ANCHORED TO THE WALL OR THE SUPPORTING CONSTRUCTION ABOUT MIDWAY ON THE RUN. SUFFICIENT FLEXIBILITY SHALL BE PROVIDED ON BRANCH RUNOUTS FROM MAINS AND RISERS TO PROVIDE FOR EXPANSION AND CONTRACTION OF PIPING. FLEXIBILITY SHALL BE PROVIDED BY INSTALLING ONE OR MORE TURNS IN THE LINE.
- H. COMMERCIAL-TYPE WATER HAMMER ARRESTERS SHALL BE PROVIDED ON HOT- AND COLD-WATER SUPPLIES AND PRECISE LOCATION AND SIZING TO BE IN ACCORDANCE WITH PDI WH 201. WATER HAMMER ARRESTERS, WHERE CONCEALED, SHALL BE ACCESSIBLE BY MEANS OF ACCESS DOORS OR REMOVABLE PANELS. COMMERCIAL-TYPE WATER HAMMER ARRESTERS SHALL CONFORM TO ASSE 1010. VERTICAL CAPPED PIPE COLUMNS WILL NOT BE PERMITTED.
- I. INSTALL AIR ADMITTANCE VALVES IN ACCORDANCE WITH CODE AND MANUFACTURER'S INSTRUCTIONS. INSTALL AIR ADMITTANCE VALVES AFTER DRAINAGE AND WASTE SYSTEM HAS BEEN ROUGHED IN. LOCATE VALVES MINIMUM 4 INCHES ABOVE HORIZONTAL BRANCH DRAIN OR FIXTURE DRAIN BEING VENTED. INSTALL VALVES IN ACCESSIBLE LOCATIONS. CONNECT VALVES TO PIPING IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. INSTALL VALVES IN UPRIGHT POSITION, WITHIN 15 DEGREES OF TRUE VERTICAL. EXTEND MINIMUM OF ONE VENT TO OPEN ATMOSPHERE FOR EACH BUILDING DRAINAGE SYSTEM. DO NOT INSTALL VALVES IN SUPPLY AND RETURN AIR PLENUMS.
- J. PROVIDE AIR-GAP FITTINGS ON DRAINING-TYPE BACKFLOW PREVENTERS AND ON INDIRECT-WASTE PIPING DISCHARGE INTO SANITARY DRAINAGE SYSTEM.
- K. HANGERS USED TO SUPPORT PIPING 2 INCHES AND LARGER SHALL BE FABRICATED TO PERMIT ADEQUATE ADJUSTMENT AFTER ERECTION WHILE STILL SUPPORTING THE LOAD. PIPE GUIDES AND ANCHORS SHALL BE INSTALLED TO KEEP PIPES IN ACCURATE ALIGNMENT, TO DIRECT THE EXPANSION MOVEMENT, AND TO PREVENT BUCKLING, SWAYING, AND UNDUE STRAIN. PIPING SUBJECTED TO VERTICAL MOVEMENT WHEN OPERATING TEMPERATURES EXCEED AMBIENT TEMPERATURES SHALL BE SUPPORTED BY VARIABLE SPRING HANGERS AND SUPPORTS OR BY CONSTANT SUPPORT HANGERS. IN THE SUPPORT OF MULTIPLE PIPE RUNS ON A COMMON BASE MEMBER, A CLIP OR CLAMP SHALL BE USED WHERE EACH PIPE CROSSES THE BASE SUPPORT MEMBER. SPACING OF THE BASE SUPPORT MEMBERS SHALL NOT EXCEED THE HANGER AND SUPPORT SPACING REQUIRED FOR AN INDIVIDUAL PIPE IN THE MULTIPLE PIPE RUN. THREADED SECTIONS OF RODS SHALL NOT BE FORMED OR BENT.

3.04 PIPE HANGERS, INSERTS, AND SUPPORTS

- A. INSTALLATION OF PIPE HANGERS, INSERTS AND SUPPORTS SHALL CONFORM TO MSS SP-58 AND MSS SP-69, EXCEPT AS MODIFIED HEREIN.

1. TYPES 5, 12, AND 26 SHALL NOT BE USED.
 2. TYPE 3 SHALL NOT BE USED ON INSULATED PIPE.
- B. TYPE 18 INSERTS SHALL BE SECURED TO CONCRETE FORMS BEFORE CONCRETE IS PLACED. CONTINUOUS INSERTS WHICH ALLOW MORE ADJUSTMENT MAY BE USED IF THEY OTHERWISE MEET THE REQUIREMENTS FOR TYPE 18 INSERTS.
- C. TYPE 19 AND 23 C-CLAMPS SHALL BE TORQUED PER MSS SP-69 AND SHALL HAVE BOTH LOCKNUTS AND RETAINING DEVICES FURNISHED BY THE MANUFACTURER.
- D. FIELD-FABRICATED C-CLAMP BODIES OR RETAINING DEVICES ARE NOT ACCEPTABLE.
- E. TYPE 20 ATTACHMENTS USED ON ANGLES AND CHANNELS SHALL BE FURNISHED WITH AN ADDED MALLEABLE-IRON HEEL PLATE OR ADAPTER.
- F. TYPE 24 MAY BE USED ONLY ON TRAPEZE HANGER SYSTEMS OR ON FABRICATED FRAMES.
- G. TYPE 39 SADDLES SHALL BE USED ON INSULATED PIPE 4 INCHES AND LARGER WHEN THE TEMPERATURE OF THE MEDIUM IS 60 DEGREES F OR HIGHER. TYPE 39 SADDLES SHALL BE WELDED TO THE PIPE.
- H. TYPE 40 SHIELDS SHALL:
1. BE USED ON INSULATED PIPE LESS THAN 4 INCHES.
 2. BE USED ON INSULATED PIPE 4 INCHES AND LARGER WHEN THE TEMPERATURE OF THE MEDIUM IS 60 DEGREES F OR LESS.
 3. HAVE A HIGH DENSITY INSERT FOR ALL PIPE SIZES. HIGH DENSITY INSERTS SHALL HAVE A DENSITY OF 8 PCF OR GREATER.
- I. HORIZONTAL AND VERTICAL PIPE SUPPORTS SHALL BE SPACED AS SPECIFIED IN MSS SP-69 AND IN ACCORDANCE WITH THE 2023 FLORIDA BUILDING CODE.
- J. A SUPPORT SHALL BE INSTALLED NOT OVER 1 FOOT FROM THE PIPE FITTING JOINT AT EACH CHANGE IN DIRECTION OF THE PIPING. PIPE SUPPORTS SHALL BE SPACED NOT OVER 5 FEET APART AT VALVES. HORIZONTAL PIPE RUNS SHALL INCLUDE ALLOWANCES FOR EXPANSION AND CONTRACTION.
- K. VERTICAL PIPE SHALL BE SUPPORTED AT EACH FLOOR, EXCEPT AT SLAB-ON-GRADE, AT INTERVALS OF NOT MORE THAN 15 FEET MAXIMUM FOR CAST IRON AND STEEL PIPING, 10 FEET MAXIMUM FOR COPPER AND CPVC/PVC PIPING, NOR MORE THAN 8 FEET FROM END OF RISERS, AND AT VENT TERMINATIONS. VERTICAL PIPE RISERS SHALL INCLUDE ALLOWANCES FOR EXPANSION AND CONTRACTION.
- L. TYPE 35 GUIDES USING STEEL, REINFORCED POLYTETRAFLUOROETHYLENE (PTFE) OR GRAPHITE SLIDES SHALL BE PROVIDED TO ALLOW LONGITUDINAL PIPE MOVEMENT. SLIDE MATERIALS SHALL BE SUITABLE FOR THE SYSTEM OPERATING TEMPERATURES, ATMOSPHERIC CONDITIONS, AND BEARING LOADS ENCOUNTERED. LATERAL RESTRAINTS SHALL BE PROVIDED AS NEEDED. WHERE STEEL SLIDES DO NOT REQUIRE PROVISIONS FOR LATERAL RESTRAINT THE FOLLOWING MAY BE USED:

1. ON PIPE LESS THAN 4 INCHES A TYPE 40 SHIELD, ATTACHED TO THE PIPE OR INSULATION, MAY FREELY REST ON A STEEL PLATE.
 - M. PIPE HANGERS ON HORIZONTAL INSULATED PIPE SHALL BE THE SIZE OF THE OUTSIDE DIAMETER OF THE INSULATION. THE INSULATION SHALL BE CONTINUOUS THROUGH THE HANGER ON ALL PIPE SIZES AND APPLICATIONS.
 - N. WHERE THERE ARE HIGH SYSTEM TEMPERATURES AND WELDING TO PIPING IS NOT DESIRABLE, THE TYPE 35 GUIDE SHALL INCLUDE A PIPE CRADLE, WELDED TO THE GUIDE STRUCTURE AND STRAPPED SECURELY TO THE PIPE. THE PIPE SHALL BE SEPARATED FROM THE SLIDE MATERIAL BY AT LEAST 4 INCHES OR BY AN AMOUNT ADEQUATE FOR THE INSULATION, WHICHEVER IS GREATER.
 - O. HANGERS AND SUPPORTS FOR PLASTIC PIPE SHALL NOT COMPRESS, DISTORT, CUT OR ABRASE THE PIPING, AND SHALL ALLOW FREE MOVEMENT OF PIPE EXCEPT WHERE OTHERWISE REQUIRED IN THE CONTROL OF EXPANSION/CONTRACTION.
 - P. STRUCTURAL ATTACHMENTS - ATTACHMENT TO BUILDING STRUCTURE CONCRETE AND MASONRY SHALL BE BY CAST-IN CONCRETE INSERTS, BUILT-IN ANCHORS, OR MASONRY ANCHOR DEVICES. INSERTS AND ANCHORS SHALL BE APPLIED WITH A SAFETY FACTOR NOT LESS THAN 5. SUPPORTS SHALL NOT BE ATTACHED TO METAL DECKING. SUPPORTS SHALL NOT BE ATTACHED TO THE UNDERSIDE OF CONCRETE FILLED FLOOR OR CONCRETE ROOF DECKS UNLESS APPROVED BY THE STRUCTURAL ENGINEER. MASONRY ANCHORS FOR OVERHEAD APPLICATIONS SHALL BE CONSTRUCTED OF FERROUS MATERIALS ONLY.
- 3.05 PIPE CLEANOUTS
- A. CLEANOUTS SHALL BE INSTALLED IN ACCORDANCE WITH THE 2023 FLORIDA BUILDING CODE.
 - B. PIPE CLEANOUTS SHALL BE THE SAME NOMINAL SIZE AS THE PIPE THEY SERVE UP TO 4 INCHES. FOR PIPE SIZES LARGER THAN 4 INCHES, THE MINIMUM SIZE OF THE CLEANOUT SHALL BE 4 INCHES.
 - C. ALL HORIZONTAL DRAINS SHALL BE PROVIDED WITH CLEANOUTS LOCATED NOT MORE THAN 100 FEET APART.
 - D. CLEANOUTS SHALL BE INSTALLED AT EACH CHANGE OF DIRECTION OF THE BUILDING DRAIN OR HORIZONTAL WASTE OR SOIL LINES GREATER THAN 45 DEGREES.
 - E. A CLEANOUT SHALL BE PROVIDED AT THE BASE OF EACH DRAIN, WASTE OR SOIL STACK.

- F. A CLEANOUT INSTALLED IN CONNECTION WITH CAST-IRON SOIL PIPE SHALL CONSIST OF A LONG-SWEEP 1/4 BEND OR ONE OR TWO 1/8 BENDS EXTENDED TO THE PLACE SHOWN. AN EXTRA-HEAVY CAST-BRASS OR CAST-IRON FERRULE WITH COUNTERSUNK CAST-BRASS HEAD SCREW PLUG SHALL BE CAULKED INTO THE HUB OF THE FITTING AND SHALL BE FLUSH WITH THE FLOOR. CLEANOUTS IN CONNECTION WITH OTHER PIPE, WHERE INDICATED, SHALL BE T-PATTERN, 90-DEGREE BRANCH DRAINAGE FITTINGS WITH CAST-BRASS SCREW PLUGS, EXCEPT PLASTIC PLUGS SHALL BE INSTALLED IN PLASTIC PIPE.
- G. CLEANOUT TEE BRANCHES WITH SCREW PLUG SHALL BE INSTALLED AT THE FOOT OF SOIL AND WASTE STACKS, AT THE FOOT OF INTERIOR DOWNSPOUTS, ON EACH CONNECTION TO BUILDING STORM DRAIN WHERE INTERIOR DOWNSPOUTS ARE INDICATED, AND ON EACH BUILDING DRAIN OUTSIDE THE BUILDING.
- H. CLEANOUTS ON PIPE CONCEALED IN PARTITIONS SHALL BE PROVIDED WITH CHROMIUM PLATED BRONZE, NICKEL BRONZE FLUSH TYPE ACCESS COVER PLATES. ROUND ACCESS COVERS SHALL BE PROVIDED AND SECURED TO PLUGS WITH SECURING SCREW. CLEANOUTS IN FINISHED WALLS SHALL HAVE ACCESS COVERS AND FRAMES INSTALLED FLUSH WITH THE FINISHED WALL.
- I. CLEANOUTS INSTALLED IN FINISHED FLOORS SUBJECT TO FOOT TRAFFIC SHALL BE PROVIDED WITH A NICKEL BRONZE COVER SECURED TO THE PLUG OR COVER FRAME AND SET FLUSH WITH THE FINISHED FLOOR. HEADS OF FASTENING SCREWS SHALL NOT PROJECT ABOVE THE COVER SURFACE.
- J. CLEANOUTS ON 6 INCH AND SMALLER PIPES SHALL BE PROVIDED WITH A CLEARANCE OF NO LESS THAN 18 INCHES FROM, AND PERPENDICULAR TO, FACE OF THE OPENING TO ANY OBSTRUCTION. CLEANOUTS FOR 8 INCH AND LARGER PIPING SHALL BE PROVIDED WITH A CLEARANCE OF NOT LESS THAN 36 INCHES FROM, AND PERPENDICULAR TO, FACE OF THE OPENING TO ANY OBSTRUCTION.
- K. ACCESS SHALL BE PROVIDED TO ALL CLEANOUTS.

3.06 TESTS, FLUSHING AND DISINFECTION

- A. PRESSURE TESTS SHALL BE PERFORMED ON THE PLUMBING SYSTEM IN ACCORDANCE WITH THE LOCAL AUTHORITY HAVING JURISDICTION AND THE 2023 FLORIDA BUILDING CODE.
- B. ROUGH IN DRAINAGE AND VENT SYSTEMS TEST SHALL INCLUDE CLOSING ALL OPENINGS IN SYSTEM AND FILLING TO THE POINT OF OVERFLOW, BUT NOT LESS THAN 10-FOOT HEAD OF WATER FOR A PERIOD OF 15 MINUTES. DURING TEST WATER LEVEL MUST NOT DROP. FINISHED PLUMBING SANITARY AND VENT TEST SHALL BE PERFORMED AFTER ALL FIXTURES ARE SET, TRAPS ARE FILLED WITH WATER AND VENT OPENINGS SEALED. INTRODUCE 1-INCH WG AIR PRESSURE INTO SYSTEM AND MAINTAIN DURING VISUAL INSPECTION OF SYSTEM FOR AND GAS OR WATER LEAKS. AIR PRESSURE MUST REMAIN CONSTANT WITHOUT INTRODUCTION OF ANY ADDITIONAL AIR DURING TEST INSPECTION.

- C. DEFECTIVE WORK - IF INSPECTION OR TEST SHOWS DEFECTS, SUCH DEFECTIVE WORK OR MATERIAL SHALL BE REPLACED OR REPAIRED AS NECESSARY AND INSPECTION AND TESTS SHALL BE REPEATED. REPAIRS TO PIPING SHALL BE MADE WITH NEW MATERIALS. CAULKING OF SCREWED JOINTS OR HOLES WILL NOT BE ACCEPTABLE.
- D. ALL PLUMBING AND NATURAL GAS TESTING IS REQUIRED TO BE WITNESSED BY THE PLUMBING INSPECTOR FOR THE AUTHORITY HAVING JURISDICTION.

3.07 SYSTEM FLUSHING

- A. BEFORE OPERATIONAL TESTS OR DISINFECTION, POTABLE WATER PIPING SYSTEM SHALL BE FLUSHED WITH POTABLE WATER. SUFFICIENT WATER SHALL BE USED TO PRODUCE A WATER VELOCITY THAT IS CAPABLE OF ENTRAINING AND REMOVING DEBRIS IN ALL PORTIONS OF THE PIPING SYSTEM. THIS REQUIRES SIMULTANEOUS OPERATION OF ALL FIXTURES ON A COMMON BRANCH OR MAIN IN ORDER TO PRODUCE A FLUSHING VELOCITY OF APPROXIMATELY 4 FPS THROUGH ALL PORTIONS OF THE PIPING SYSTEM. CONTRACTOR SHALL PROVIDE ADEQUATE PERSONNEL TO MONITOR THE FLUSHING OPERATION AND TO ENSURE THAT DRAIN LINES ARE UNOBSTRUCTED IN ORDER TO PREVENT FLOODING OF THE FACILITY. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY FLOOD DAMAGE RESULTING FROM FLUSHING OF THE SYSTEM. FLUSHING SHALL BE CONTINUED UNTIL ENTRAINED DIRT AND OTHER FOREIGN MATERIALS HAVE BEEN REMOVED AND UNTIL DISCHARGE WATER SHOWS NO DISCOLORATION. ALL FAUCETS AND DRINKING WATER FOUNTAINS, TO INCLUDE ANY DEVICE CONSIDERED AS AN END POINT DEVICE BY NSF/ANSI 61, SECTION 9, SHALL BE FLUSHED A MINIMUM OF 0.25 GALLONS PER 24 HOUR PERIOD, TEN TIMES OVER A 14 DAY PERIOD.
- B. AFTER FLUSHING - SYSTEM SHALL BE DRAINED AT LOW POINTS. STRAINER SCREENS SHALL BE REMOVED, CLEANED, AND REPLACED. AFTER FLUSHING AND CLEANING, SYSTEMS SHALL BE PREPARED FOR TESTING BY IMMEDIATELY FILLING WATER PIPING WITH CLEAN, FRESH POTABLE WATER. ANY STOPPAGE, DISCOLORATION, OR OTHER DAMAGE TO THE FINISH, FURNISHINGS, OR PARTS OF THE BUILDING DUE TO THE CONTRACTOR'S FAILURE TO PROPERLY CLEAN THE PIPING SYSTEM SHALL BE REPAIRED BY THE CONTRACTOR. WHEN THE SYSTEM FLUSHING IS COMPLETE, THE HOT-WATER SYSTEM SHALL BE ADJUSTED FOR UNIFORM CIRCULATION.
- C. FLUSHING DEVICES AND AUTOMATIC CONTROL SYSTEMS SHALL BE ADJUSTED FOR PROPER OPERATION ACCORDING TO MANUFACTURER'S INSTRUCTIONS. COMPLY WITH ASHRAE 90.1 - IP FOR MINIMUM EFFICIENCY REQUIREMENTS. UNLESS MORE STRINGENT LOCAL REQUIREMENTS EXIST, LEAD LEVELS SHALL NOT EXCEED LIMITS ESTABLISHED BY 40 CFR 141.80 (C)(1). THE WATER SUPPLY TO THE BUILDING SHALL BE TESTED SEPARATELY TO ENSURE THAT ANY LEAD CONTAMINATION FOUND DURING POTABLE WATER SYSTEM TESTING IS DUE TO WORK BEING PERFORMED INSIDE THE BUILDING.

3.08 OPERATIONAL TEST

- A. UPON COMPLETION OF FLUSHING AND PRIOR TO DISINFECTION PROCEDURES, THE CONTRACTOR SHALL SUBJECT THE PLUMBING SYSTEM TO OPERATING TESTS TO DEMONSTRATE SATISFACTORY INSTALLATION, CONNECTIONS, ADJUSTMENTS, AND FUNCTIONAL AND OPERATIONAL EFFICIENCY. SUCH OPERATING TESTS SHALL COVER A PERIOD OF NOT LESS THAN 8 HOURS FOR EACH SYSTEM AND SHALL INCLUDE THE FOLLOWING INFORMATION IN A REPORT WITH CONCLUSION AS TO THE ADEQUACY OF THE SYSTEM:
1. TIME, DATE, AND DURATION OF TEST.
 2. WATER PRESSURES AT THE MOST REMOTE AND THE HIGHEST FIXTURES.
 3. OPERATION OF EACH FIXTURE AND FIXTURE TRIM.
 4. OPERATION OF EACH VALVE, HYDRANT, AND FAUCET.
 5. PUMP SUCTION AND DISCHARGE PRESSURES.
 6. TEMPERATURE OF EACH DOMESTIC HOT-WATER SUPPLY.
 7. OPERATION OF EACH FLOOR AND ROOF DRAIN BY FLOODING WITH WATER.
 8. OPERATION OF EACH VACUUM BREAKER AND BACKFLOW PREVENTER.
 9. COMPLETE OPERATION OF EACH WATER PRESSURE BOOSTER SYSTEM, INCLUDING PUMP START PRESSURE AND STOP PRESSURE.

3.09 DISINFECTION

- A. AFTER ALL SYSTEM COMPONENTS ARE PROVIDED AND OPERATIONAL TESTS ARE COMPLETE, THE ENTIRE DOMESTIC HOT- AND COLD- WATER DISTRIBUTION SYSTEM SHALL BE DISINFECTED. BEFORE INTRODUCING DISINFECTING CHLORINATION MATERIAL, ENTIRE SYSTEM SHALL BE FLUSHED WITH POTABLE WATER UNTIL ANY ENTRAINED DIRT AND OTHER FOREIGN MATERIALS HAVE BEEN REMOVED.
- B. WATER CHLORINATION PROCEDURE SHALL BE IN ACCORDANCE WITH LOCAL AUTHORITY HAVING JURISDICTION, _____, AWWA C651 AND AWWA C652 AS MODIFIED AND SUPPLEMENTED BY THIS SPECIFICATION. THE CHLORINATING MATERIAL SHALL BE HYPOCHLORITES OR LIQUID CHLORINE. THE CHLORINATING MATERIAL SHALL BE FED INTO THE WATER PIPING SYSTEM AT A CONSTANT RATE AT A CONCENTRATION OF AT LEAST 50 PARTS PER MILLION (PPM). ISOLATE AND ALLOW SYSTEM TO STAND FOR A MINIMUM OF 24 HOURS OR FILL SYSTEM WITH A CHLORINE/WATER SOLUTION AT A CONCENTRATION OF AT LEAST 200 PPM AND ALLOW TO STAND FOR A MINIMUM OF 3 HOURS.
- C. FLUSH WITH CLEAN POTABLE WATER UNTIL NO CHLORINE IS PRESENT AND TEST SYSTEM FOR BIOLOGICAL CONTAMINATION. REPEAT ABOVE PROCEDURES SHOULD ANY BIOLOGICAL CONTAMINATION BE DETECTED. SUBMIT WATER SAMPLES IN STERILE BOTTLES TO THE AUTHORITY HAVING JURISDICTION.

END OF SPECIFICATIONS

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SECTION 23 00 00 - SHEET SPECIFICATION - MECHANICAL

DIVISION 23 - MECHANICAL SPECIFICATIONS

1.01 GENERAL MECHANICAL REQUIREMENTS:

- A. REQUIREMENTS SPECIFIED IN DIVISION 1 , INSTRUCTIONS TO BIDDERS, SUPPLEMENTAL GENERAL CONDITIONS, SPECIAL CONDITIONS, ADDENDA, ALTERNATES, CONTRACT AND PROPOSAL (AS APPLICABLE), ALONG WITH THESE SPECIFICATIONS AND ALL ITS SECTIONS, COMPRISE THE CONTRACT DOCUMENTS FOR THE MECHANICAL CONTRACT. DRAWINGS AND ALL THEIR REVISIONS UP TO THE BID SUBMITTAL DATE BECOME A BINDING PART OF THE CONTRACT, ALONG WITH THESE SPECIFICATIONS AS THOUGH THEY WERE ONE, AND ANYTHING IMPLIED BY THE SPECIFICATIONS SHALL BE INTERPRETED AS ALSO IMPLIED BY THE DRAWINGS AND VICE VERSA.
- B. THE CONTRACTOR SHALL EXAMINE THE PROJECT SITE AND SURROUNDING AREAS AND MAKE ALL NECESSARY INVESTIGATIONS REQUIRED TO INFORM THEMSELVES AS TO ALL DIFFICULTIES THAT MAY BE ENCOUNTERED IN THE EXECUTION OF THE CONTRACT DOCUMENTS.
- C. THE CONTRACTOR SHALL EXAMINE ALL DRAWINGS, SPECIFICATIONS, AND ALL OTHER DATA OR INSTRUCTIONS PERTAINING TO THE WORK REGARDLESS OF WHAT DRAWING IT MAY APPEAR OR IN WHICH SPECIFICATION IT IS DESCRIBED. THE CONTRACTOR WILL NOT BE ALLOWED EXTRA COMPENSATION RESULTING FROM THE CONTRACTOR'S FAILURE TO FULLY EXAMINE ALL THE DRAWINGS, SPECIFICATIONS, DATA, AND INSTRUCTIONS.
- D. WITH THE EXCEPTION OF SYSTEMS AND EQUIPMENT FURNISHED BY OWNER IF SPECIFIED, IT IS INTENDED THAT WORK COVERED BY THESE SPECIFICATIONS AND DRAWINGS INCLUDE EVERYTHING REQUISITE TO MAKE THE VARIOUS SYSTEMS COMPLETE AND OPERATIVE, IRRESPECTIVE OF WHETHER OR NOT EVERY ITEM IS SPECIFICALLY PROVIDED FOR. ANY OMISSION OF DIRECT REFERENCE TO ANY ESSENTIAL ITEM SHALL NOT EXCUSE THE CONTRACTOR FROM COMPLYING WITH THE ABOVE INTENT.
- E. THE MECHANICAL DRAWINGS AND SPECIFICATIONS ARE MEANT TO SUPPLEMENT EACH OTHER. IN CASE OF AN INCONSISTENCY, THE MOST STRINGENT REQUIREMENT SHALL GOVERN. FIGURED DIMENSIONS SUPERSEDE SCALED ONES. THE CONTRACTOR SHALL NOT TAKE ADVANTAGE OF ANY INCONSISTENCY IN SPECIFICATIONS AND DRAWINGS AND SHALL PROMPTLY CALL THE OWNER'S ATTENTION TO ANY INCONSISTENCY IN THE SPECIFICATIONS AND DRAWINGS.

- F. LAYOUT OF EQUIPMENT, DUCTWORK, ACCESSORIES, SPECIALTIES AND SUSPENDED, CONCEALED OR EXPOSED PIPING SYSTEMS ARE DIAGRAMMATIC UNLESS DIMENSIONED. IN PREPARING SHOP DRAWINGS, THE CONTRACTOR SHALL CHECK PROJECT CONDITIONS BEFORE INSTALLING THE WORK. IF THERE ARE ANY INTERFERENCES OR CONFLICTS, THEY SHALL BE CALLED TO THE ATTENTION OF THE OWNER IMMEDIATELY FOR CLARIFICATION.
- G. THE MECHANICAL CONTRACTOR SHALL KEEP ON THE JOB ONE COMPLETE SET OF THE CONTRACT WORKING DRAWINGS ON WHICH HE SHALL RECORD ANY DEVIATIONS OR CHANGES FROM SUCH CONTRACT DRAWINGS MADE DURING CONSTRUCTION. THE RECORD DRAWINGS SHALL SHOW CHANGES TO SIZE, TYPE, CAPACITY, ETC. OF ANY MATERIAL. UPON COMPLETION AND FINAL ACCEPTANCE OF THE PROJECT, THE CONTRACTOR SHALL PROVIDE THE OWNER WITH TWO (2) SETS OF "AS BUILT" DRAWINGS.
- H. CONTRACTOR SHALL COORDINATE THE WORK OF THE DIFFERENT TRADES SO THAT INTERFERENCE BETWEEN DUCTWORK, PIPING, EQUIPMENT, STRUCTURAL, AND ELECTRICAL WORK WILL BE AVOIDED. ALL NECESSARY OFFSETS IN PIPING AND DUCTWORK, AND ALL FITTINGS, AND OTHER COMPONENTS, REQUIRED TO INSTALL THE WORK PROPERLY SHALL BE FURNISHED COMPLETE IN PLACE AT NO ADDITIONAL COST.
- I. PRIOR TO SUBMITTING SHOP DRAWINGS, THE CONTRACTOR SHALL CHECK FOR DIMENSIONAL CORRECTNESS, INTERFERENCES AND CONFORMANCE TO SPECIFICATIONS AND PLANS. THE CONTRACTOR IS TO SUBMIT ELECTRONIC SHOP DRAWINGS IN PDF FORMAT, CATALOG SHEETS FOR EQUIPMENT, FIXTURES, DUCTWORK LAYOUT AND WIRING DIAGRAMS TO THE ARCHITECT FOR REVIEW. EACH CONTRACTOR IS RESPONSIBLE TO DISTRIBUTE APPROVED SHOP DRAWINGS TO ALL OTHER TRADES AFFECTED BY HIS WORK AND EQUIPMENT.
- J. THE CONTRACTOR MAY OFFER SUBSTITUTIONS WITH HIS BID EXCEPT FOR CERTAIN ITEMS WHICH MAY BE INDICATED AS HAVING NO SUBSTITUTE. ONLY ONE REQUEST FOR SUBSTITUTION WILL BE CONSIDERED FOR EACH PRODUCT. WHEN THE SUBSTITUTION IS NOT ACCEPTED, THE SPECIFIED PRODUCT SHALL BE PROVIDED.
- K. THE CONTRACTOR SHALL ARRANGE AND PAY FOR ALL PERMITS, FEES AND INSPECTIONS REQUIRED IN CONNECTION WITH THIS INSTALLATION. THE CONTRACTOR MUST PRESENT THE OWNER WITH PROPERLY SIGNED CERTIFICATES OF FINAL INSPECTION BEFORE WORK WILL BE ACCEPTED.
- L. THE CONTRACTOR SHALL NOTIFY THE UTILITY COMPANIES AS REQUIRED BY LAW AND DETERMINE THE EXACT LOCATIONS OF EXISTING UTILITIES, PRIOR TO BEGINNING WORK. ALL ACTIVE SERVICES ENCOUNTERED SHALL BE PROTECTED AND SUPPORTED. ALL INACTIVE SERVICES SHALL BE REMOVED OR DEACTIVATED AS SHOWN OR DIRECTED BY OWNER. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER AND UTILITY COMPANIES FOR UTILITY TIE-INS FOR THIS WORK AND SHALL PAY ALL FEES AND CHARGES RELATED TO THIS WORK.

- M. THE CONTRACTOR SHALL GIVE NOTICES AND COMPLY WITH LAWS, ORDINANCES, RULES, REGULATIONS AND ORDERS OF ANY PUBLIC AUTHORITY BEARING ON THE WORK. IF THE CONTRACTOR OBSERVES THE CONTRACT DOCUMENTS ARE AT VARIANCE WITH SUCH IN ANY RESPECT, PROMPTLY NOTIFY THE OWNER, IN WRITING SUCH THAT ALL NECESSARY CHANGES CAN BE MADE. IF CONTRACTOR KNOWINGLY PERFORMS ANY WORK CONTRARY TO SUCH WITHOUT NOTICE TO THE OWNER, HE SHALL ASSUME FULL RESPONSIBILITY THEREFORE AND SHALL BEAR COST ATTRIBUTED THERETO.
- N. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN A NEAT AND WORKMANLIKE MANNER. MATERIALS SHALL BE NEW. SECONDS OR DAMAGED MATERIALS SHALL NOT BE USED. THE CONTRACTOR IS RESPONSIBLE FOR THE SAFETY AND GOOD CONDITION OF THE EQUIPMENT, MATERIALS AND SYSTEMS INSTALLED UNTIL FINAL ACCEPTANCE BY THE OWNER. ALL MATERIALS SHALL BE STORED IN SUCH A MANNER AS TO PREVENT ANY DAMAGE PRIOR TO INSTALLATION.
- O. THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR DAMAGE CAUSED BY HIS WORK OR THROUGH NEGLECT OF HIS WORKMEN. REPAIRING OF DAMAGED WORK SHALL BE DONE BY THE CONTRACTOR AS DIRECTED BY THE OWNER. COST OF REPAIRS SHALL BE PAID BY THE CONTRACTOR.
- P. THE CONTRACTOR SHALL TEST ALL HIS EQUIPMENT AND WORK IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE. ALL EQUIPMENT, FIXTURES, APPARATUS, ETC. SHALL COMPLY FULLY WITH THE REQUIREMENTS OF THE SPECIFICATIONS AND DRAWINGS.
- Q. THE CONTRACTOR SHALL WARRANT ALL MATERIALS AND ALL WORK INSTALLED BY HIM OR HIS SUBCONTRACTORS FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE.
- R. PRIOR TO FINAL ACCEPTANCE, THE CONTRACTOR SHALL CLEAN ALL EQUIPMENT AND SYSTEMS TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE.

1.02 HVAC GENERAL SPECIFICATIONS:

- A. THE CONTRACTOR SHALL FURNISH ALL MATERIALS MEETING AIEE, ASME, ASTM, AND NEMA SPECIFICATIONS. THE CONSTRUCTION AND INSTALLATION OF WORK SHALL CONFORM TO THE LATEST EDITION OF THE SMACNA HVAC DUCT CONSTRUCTION STANDARDS.
- B. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY MATERIALS, EQUIPMENT, TRANSPORTATION, HOISTING ETC. NECESSARY TO INSTALL A COMPLETE AND OPERABLE HEATING, VENTILATING AND AIR CONDITIONING SYSTEM.
- C. THE CONTRACTOR SHALL PAY FOR AND HAVE THE MECHANICAL SYSTEM BALANCED BY AN INDEPENDENT AIR BALANCING COMPANY. THE REPORT IS TO INCLUDE EXHAUST CFM WITH ONE (1) DIGITAL AND ONE (1) PAPER COPIES TO BE SUBMITTED TO THE OWNER PRIOR TO FINAL ACCEPTANCE.

- D. THE CONTRACTOR SHALL ARRANGE FOR AND PROVIDE TRAINING ON ALL AIR HANDLING SYSTEMS, HEATING SYSTEMS, COOLING SYSTEMS, PUMPING SYSTEMS, and CONTROL SYSTEMS AS RECOMMENDED BY THE MANUFACTURER AND TO THE SATISFACTION OF THE OWNER.
- E. MECHANICAL SLEEVE SEALS: MODULAR SEALING ELEMENT UNIT, DESIGNED FOR FIELD ASSEMBLY, TO FILL ANNULAR SPACE BETWEEN PIPE AND SLEEVE.
- F. ESCUTCHEONS: MANUFACTURED WALL AND CEILING ESCUTCHEONS AND FLOOR PLATES, WITH AN ID TO CLOSELY FIT AROUND PIPE, TUBE, AND INSULATION OF INSULATED PIPING AND AN OD THAT COMPLETELY COVERS OPENING.
- G. GROUT: ASTM C 1107, GRADE B, NONSHRINK AND NONMETALLIC, DRY HYDRAULIC-CEMENT GROUT.

1.03 HVAC DUCT AND ACCESSORIES:

- A. DUCTWORK AND PLENUMS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA HVAC DUCT STANDARDS AS FOLLOWS:
 - 1. CONSTRUCT NON-VAV SUPPLYDUCTS TO MEET SMACNA POSITIVE PRESSURE OF 2 INCHES W.G. CONSTRUCT RETURN, OUTDOOR AND EXHAUST DUCTWORK UPSTREAM OF FANS TO MEET SMACNA NEGATIVE PRESSURE OF 2 INCHES W.G. CONSTRUCT EXHAUST DUCTWORK DOWNSTREAM OF FANS TO MEET SMACNA POSITIVE PRESSURE OF 2 INCHES W.G.
 - 2. ALL ABOVEGROUND DUCTWORK SHALL BE FABRICATED OF NEW GALVANIZED SHEET STEEL, OR ALUMINUM WHERE CALLED FOR ON DRAWINGS, AND SHALL BE CONSTRUCTED AND BRACED IN ACCORDANCE WITH THE STANDARDS SET FORTH IN LATEST EDITION OF THE SMACNA CONSTRUCTION STANDARDS.
 - 3. DUCT DIMENSIONS SHOWN ARE FREE INSIDE DIMENSIONS AND SHALL BE FOLLOWED UNLESS JOB CONDITIONS REQUIRE ALTERATIONS. DUCT SIZE REVISIONS SHALL BE BASED ON THE EQUAL FRICTION METHOD.
 - 4. ALL ELBOWS IN THE SYSTEM SHALL BE MADE WITH CENTERLINE RADIUS OF ONE AND ONE-HALF (1-1/2) TIMES THE TURNING WIDTH OF THE DUCT. WHERE SPACE PROHIBITS THE SPECIFIED MINIMUM RADIUS, SQUARE ELBOWS WITH DOUBLE RADIUS TURNING VANES SCREWED IN PLACE MAY BE USED. CHANGES IN DUCT SIZES SHALL HAVE MAXIMUM FLOW ANGLES OF 15° DIVERGING AND 60° CONTRACTING.
 - 5. THE MECHANICAL DRAWINGS INDICATE THE GENERAL ROUTING OF DUCTWORK. WHEN JOB CONDITIONS WARRANT ALTERATIONS, THE EXACT ROUTE SHALL BE COORDINATED WITH ALL OTHER TRADES.
 - 6. HANGERS TO BE PLACED 8 FEET ON CENTERS MAXIMUM WITH 1" X GAUGE MINIMUM STRAPS FOR DUCTS. ALL DUCTWORK SHALL BE SEALED.
 - 7. FIBERGLASS DUCTBOARD WILL NOT BE PERMITTED.
- B. DUCTWORK INSULATION AND JACKETS SHALL BE AS FOLLOWS:
 - 1. ALL MATERIALS SHALL HAVE FLAME SPREAD/SMOKE DEVELOPMENT RATING OF 25/50 IN ACCORDANCE WITH ASTM E84, NFPA 225, AND U.L. 723.

2. TYPE A: FLEXIBLE GLASS FIBER ALL SERVICE DUCT WRAP WITH A "K" VALUE OF 0.25 AT 75°F, FOIL SCRIM VAPOR BARRIER FACING AND A DENSITY OF 1.5 PCF.
3. EXHAUST DUCTS CONCEALED ABOVE CEILINGS SHALL BE INSULATED WITH 1-1/2" THICK TYPE A INSULATION PROVIDING 100% COVERAGE OF ADHESIVE WITH EDGES TIGHTLY BUTTED. ALL JOINTS SHALL BE SEALED BY TAPING WITH 3" WIDE VAPOR BARRIER TAPE. PATCHES OF TAPE SHALL BE APPLIED WHERE PINS PROTRUDE THROUGH THE FACING.
4. ACCEPTABLE MANUFACTURERS: OWENS-CORNING, JOHNS MANVILLE, CERTAINTEED, KNAUF

1.04 Hangers and supports

- A. PROVIDE MSS SP-58 AND MSS SP-69, TYPE 1 WITH ADJUSTABLE TYPE STEEL SUPPORT RODS, EXCEPT AS SPECIFIED OR INDICATED OTHERWISE.
- B. ATTACH TO STEEL JOISTS WITH TYPE 19 OR 23 CLAMPS AND RETAINING STRAPS.
- C. ATTACH TO STEEL W OR S BEAMS WITH TYPE 21, 28, 29, OR 30 CLAMPS.
- D. ATTACH TO HORIZONTAL WEB STEEL CHANNEL AND WOOD WITH DRILLED HOLE ON CENTERLINE AND DOUBLE NUT AND WASHER.
- E. ATTACH TO CONCRETE WITH TYPE 18 INSERT OR DRILLED EXPANSION ANCHOR.
- F. PROVIDE HANGERS AND SUPPORTS BY ANVIL INTERNATIONAL, COOPER B-LINE OR GRINNELL:
 1. SPLIT RING HANGERS – CARBON STEEL WITH ADJUSTABLE SWIVEL.
 2. CLEVIS HANGERS - CARBON STEEL WITH ADJUSTABLE SWIVEL.
 3. MULTIPLE OR TRAPEZE HANGERS – STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS. PROVIDE CAST IRON ROLL FOR PIPE SIZES 6 INCH AND LARGER.

1.05 HVAC EQUIPMENT SPECIFICATIONS

- A. CABINET ELECTRIC UNIT HEATER SHALL BE QMARK MODEL RECESS MOUNTED WITH GALVANIZED STEEL ENCLOSURE, STEEL SHEATH HEATING ELEMENTS WITH STEEL FINS, PERMANENTLY LUBRICATED FAN MOTOR, AUTOMATIC RESET THERMAL OVERLOAD PROTECTION, INTEGRAL THERMOSTAT, DISCONNECT SWITCH, HEATING CAPACITY AND VOLTAGE AS SCHEDULED.
- B. EXHAUST FANS: CAPACITY HP, VOLTAGE, AND ACCESSORIES AS SCHEDULED.

1.06 TESTING, ADJUSTING, AND BALANCING

- A. TESTING, ADJUSTING, BALANCING: AFTER INSTALLATION CHECK ALL NEW AND EXISTING EQUIPMENT AND PERFORM START UP IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. BALANCE ALL SYSTEMS, CALIBRATE CONTROLS, CHECK FOR PROPER OPERATIONAL AND SEQUENCE UNDER ALL CONDITIONS AND MAKE ALL NECESSARY ADJUSTMENTS. SUBMIT AIR AND WATER BALANCE REPORTS FROM INDEPENDENT AABC OR NEBB CERTIFIED CONTRACTOR FOR ALL AIR SYSTEMS PER AABC OR NEBB STANDARDS.
- B. BALANCE, START UP, AND INSTRUCTIONS: AFTER EQUIPMENT IS PLACED IN OPERATION, SYSTEMS SHALL BE BALANCED TO WITHIN 10% OF DESIGN WITH REPORT SUBMITTED TO OWNER. BALANCE AIR SYSTEMS PRIOR TO BALANCING HYDRONIC SYSTEMS. CONTRACTOR SHALL ADJUST AND/OR REPLACE AS NECESSARY THE FAN AND MOTOR PULLEYS AND SHEAVES TO ACHIEVE DESIGN WITHIN 10%. TEST, ADJUST, AND BALANCE COOLING SYSTEMS DURING SUMMER SEASON AND HEATING SYSTEMS DURING WINTER SEASON. START UP AND PLACE ALL SYSTEMS IN OPERATION. INSTRUCT OWNER ON PROPER OPERATION AND PREVENTATIVE MAINTENANCE OF SYSTEM(S).

1.07 HVAC CONTROLS

- A. EQUIPMENT CONTROLLED BY THERMOSTAT
 - 1. PROVIDE THERMOSTAT CONTROL EQUIPMENT WITH SUFFICIENT COMMUNICATION, PROGRAMMING, INPUT AND OUTPUT CONNECTIONS, AND MODULATING OR STAGING CAPABILITY TO MEET THE SEQUENCE OF OPERATIONS. PROVIDE THERMOSTATS WITH THE FEATURES AS INDICATED:
 - a. ADJUST TEMPERATURE SETPOINT.
 - b. INSULATED BACKING FOR EXTERIOR WALL MOUNTING.
 - 2. LINE-VOLTAGE, ON-OFF THERMOSTATS: BIMETAL-ACTUATED, OPEN CONTACT OR BELLOWS-ACTUATED, ENCLOSED, SNAP-SWITCH OR EQUIVALENT SOLID-STATE TYPE, WITH HEAT ANTICIPATOR; LISTED FOR ELECTRICAL RATING; WITH CONCEALED SET-POINT ADJUSTMENT, 55 TO 85 DEG F SET-POINT RANGE, AND 2 DEG F MAXIMUM DIFFERENTIAL.

END OF SPECIFICATIONS

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Luminaires shall be provided as specified in the Luminaire Schedule or as indicated on the Drawings complete with lamps, power wiring, and control for a fully operational system. Contractor is responsible for providing proper mounting accessories. Contractor shall refer to this Specification for LED and driver requirements. Refer to the Drawings and Specifications for control requirements. Submittals shall include product information for luminaires. Where a catalog number and a narrative or pictorial description are provided, the written description shall take precedence. If equal or alternate luminaire Manufacturers are not indicated, then the luminaires shall be provided as specified. The Engineer is not responsible for the performance of substituted luminaires approved by the Architect or Owner without the consent of, or review by, the Engineer.
- B. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.03 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. IP: International Protection or Ingress Protection Rating.
- D. LED: Light-emitting diode.
- E. LER: Luminaire efficacy rating.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting fixture, including lamp, reflector, and housing.

1.04 SUBMITTALS

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

END OF SECTION 26 51 00

SECTION 26 56 68 - EXTERIOR ATHLETIC LIGHTING

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. Luminaires, lamps, and ballasts.
 - 2. Support structures.
 - 3. Power distribution and control.
 - 4. Egress lighting.
 - 5. Surge protection.
 - 6. Pole and base protection.
- B. Related Requirements:
 - 1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables"
 - 2. Section 260526 "Grounding and Bonding for Electrical Systems"
 - 3. Section 260533.13 "Conduit for Electrical Systems"
 - 4. Section 260553 "Identification for Electrical Systems"
 - 5. Section 262416 "Panelboards"
 - 6. Section 265600 "Exterior Lighting" for exterior luminaires and photoelectric relays.
- C. Illuminating Engineering Society Lighting Handbook - 10th Edition
- D. IES RP-6-22 Recommended Practice Lighting Sports and Recreational Areas

1.03 DEFINITIONS

- A. ENGINEER: The Osborn Engineering Company.
- B. BIDDER: Each contractor that is bidding the project.
- C. CONTRACTOR: The Responsible independent party that has been selected and agrees to provide products or services or both for the Project that meets or exceeds specifications.
- D. THE AUTHORITY HAVING JURISDICTION (AHJ): The office or Agency responsible for assuring the work's compliance with the Building Code.
- E. Coefficient of Variation (CV): A statistical measure of the weighted average of all relevant illumination values for the playing area, expressed as the ratio of the standard deviation for all illuminance values to the mean illuminance value.
- F. Fixture: See "Luminaire."

- G. Illuminance: The metric most commonly used to evaluate lighting systems. It is the density of luminous flux, or flow of light, reaching a surface divided by the area of that surface.
 - 1. Horizontal Illuminance: Measurement in foot-candles, on a horizontal surface 36 inches (914.4 mm) above ground unless otherwise indicated.
 - 2. Target Illuminance: Average maintained illuminance level, calculated by multiplying initial illuminance by LLF.
 - 3. Vertical Illuminance: Measurement in foot-candles, in two directions on a vertical surface, at an elevation coinciding with plane height of horizontal measurements.
- H. LC: Lighting Certified.
- I. Light-Loss Factor (LLF): A factor used in calculating the level of illumination after a given period of time and under given conditions. It takes into account temperature, dirt accumulation on the luminaire, lamp depreciation, maintenance procedures, and atmospheric conditions. An LLF includes a recoverable light-loss factor.
- J. Luminaire: A complete lighting unit, internally lighted exit sign, or emergency lighting unit. Luminaires include lamps and the parts required to distribute light, position and protect lamps, and connect lamps to power supply. Note that "fixture" and "luminaire" may be used interchangeably and the "IES Lighting Handbook" uses "luminaire" over "fixture."
- K. Pole: Luminaire support structure, including tower used for large area illumination.
- L. Uniformity Gradient (UG): The rate of change of illuminance on the playing field, expressed as a ratio between the illuminances of adjacent measuring points on a uniform grid.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of lighting product.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of the luminaires.
 - 4. Ballast, including BF, UL listing and recognition, ANSI certification, and Energy Independence and Security Act of 2007 compliance.
 - 5. Lamps, including life, output (lumens, CCT, and CRI), and energy-efficiency data.
 - 6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides," of each lighting luminaire type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the luminaire as applied in this Project.
 - a. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
 - b. Manufacturer Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
 - 7. Photoelectric relays.
 - 8. Means of attaching luminaires to supports and indication that attachment is suitable for components involved.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.

2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
- C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For exterior athletic lighting 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. Layouts and illumination levels shall be in compliance with IES RP-6.
 - a. Optimize selection, location, and aiming of luminaires.
 - b. Scans for both initial and maintained light levels shall be submitted along with the specified spill light calculations.
 - c. Field lighting layout shall show footcandle levels on a 30' by 30' grid.
 2. Class of Play:
 3. Drawings and specifications for construction of lighting system.
 4. Manufacturer's determination of LLF used in design calculations.
 5. Lighting system design calculations for the following:
 - a. Target illuminance.
 - b. Point calculations of horizontal and vertical illuminance, CV, and UG at minimum grid size and area.
 - c. Point calculations of horizontal and vertical illuminance in indicated areas of concern for spill light.
 - d. Calculations of source intensity of luminaires observed at eye level from indicated properties near the playing fields.
 6. Electrical system design calculations for the following:
 - a. Short-circuit current calculations for rating of panelboards.
 - b. Total connected and estimated peak-demand electrical load, in kilowatts, of lighting system.
 - c. Capacity of feeder required to supply lighting system.
 7. Wiring requirements, including required conductors, cables, and wiring methods.
 8. Structural analysis data and calculations used for pole selection.
 - a. Manufacturer Wind-Load Strength Certification: Submit certification that selected total support system, including poles, complies with AASHTO LTS-6-M for location of Project.

1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Luminaires.
 2. Luminaire support structures.
 3. Limits of athletic fields.
 4. Proposed underground utilities and structures.
 5. Existing underground utilities and structures.
 6. Athletic field support structures.
- B. Qualification Data: For qualified Installer.

- C. Seismic Qualification Data: Certificates, for luminaires, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Welding certificates.
- E. Product Certificates:
 - 1. For each type of ballast for bi-level and dimmer-controlled luminaire, from manufacturer.
 - 2. For support structures, including brackets, arms, appurtenances, bases, anchorages, and foundations, from manufacturer.
- F. Field quality-control reports.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
- B. Upon completion of commissioning and acceptance, the contractor shall issue a final report submission including the final field and court conditions and illumination.
 - 1. All fields and courts shall be in compliance with IES RP-6 .
 - 2. Provide Final Aiming Report.

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: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - 3. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - 4. Fuses: Ten for every 100 of each type and rating installed. Furnish at least one of each type.

1.08 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Manufacturer Qualifications: Manufacturer's responsibilities include fabricating sports lighting and providing professional engineering services needed to assume engineering responsibility.

1. Engineering Responsibility: Preparation of delegated-design submittals and comprehensive engineering analysis by a qualified professional engineer who is additionally certified as an LC by the National Council on Qualifications for the Lighting Professions.
- C. Luminaire Photometric Data Testing Laboratory Qualifications:
 1. Luminaire manufacturers' laboratory accredited under the NVLAP for Energy Efficient Lighting Products.
 2. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.
- D. Field Testing Agency Qualifications: An independent testing agency that is accredited under the NVLAP for Energy Efficient Lighting Products, a member company of NETA, or an NRTL as defined in 29 CFR 1910.7, with the experience and capability to conduct field testing in accordance with IES LM-5.
- E. Field Testing Agency Qualifications: A qualified independent professional engineer not associated with Contractor or lighting equipment manufacturer, who is additionally certified as an LC by the National Council on Qualifications for the Lighting Professions.
- F. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 1. AWS D1.1/D1.1M.
 2. AWS D1.2/D1.2M.
- 1.09 DELIVERY, STORAGE, AND HANDLING
 - A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.
- 1.10 WARRANTY
 - A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of luminaires, lamps, and luminaire alignment products and to correct misalignment that occurs subsequent to successful acceptance tests. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, and unauthorized repairs and alterations from special warranty coverage.
 1. Luminaire and luminaire assembly (excluding fuses) shall be free from defects in materials and workmanship for a period of fifteen years from date of Substantial Completion.
 2. Preventative and Spot Maintenance: Manufacturer shall provide all preventative and spot maintenance, including parts and labor for 15 years from the date of final acceptance. Individual lamp outages shall be repaired when the outage causes the light on the field to drop below 1% of the maintained light levels or when a fixture outage, at owner's discretion, materially impacts safety and/or playability of the field. Owner agrees to check fuses in the event of a luminaire outage.
 3. Alignment Warranty: Accuracy of alignment of luminaires shall remain within specified illuminance uniformity ratios for the same period of length as the luminaire warranty, from date of successful completion of acceptance tests.

- a. Realign luminaires that become misaligned every two (2) during the warranty period.
- b. Replace alignment products that fail within the warranty period.
- c. Verify successful realignment of luminaires by retesting.

B. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
1. MUSCO
 2. Mako M3
 3. Sportsbeams
 4. AEON

2.02 PERFORMANCE REQUIREMENTS

- A. Pole placement shall be as specified on civil engineering drawings. Alternate locations can be proposed by manufacturer, and are subject to approval.
1. Quantity of poles shall be:
- B. Illumination Calculations: Computer-analyzed point method complying with IES RP-6 to optimize selection, location, and aiming of luminaires.
1. Grid Pattern Dimensions: For playing areas of each sport and areas of concern for spill-light control, correlate and reference calculated parameters to the grid areas. Each grid point represents the center of the grid area defined by the length and width of the grid spacing.
 2. Spill-Light Control: Minimize spill light for each playing area on adjacent and nearby areas.
 - a. Prevent light trespass on properties near Project as defined by ____.
 - b. For areas indicated on Drawings as "spill-light critical," limit the level of illuminance directed into the area from any luminaire or group of luminaires, and measured 36 inches (914.4 mm) above grade to the following:
 - 1) Maximum Horizontal Illuminance: 0.25 fc.
 - 2) Maximum Vertical Illuminance from the Direction of the Greatest Contribution of Light: 1.0 fc.
 - c. Calculate the horizontal and vertical illuminance due to spill light for points spaced 20 feet (609.6 cm) apart in areas indicated on Drawings as "spill-light critical," to ensure that design complies with the above limits.
 3. Glare Control: Design illumination for each playing area to minimize direct glare in adjacent and nearby areas.
 - a. Design source intensity of luminaires that may be observed at an elevation of 60 inches (1524 mm) above finished grade from nearby properties to be less than 12,000 candela when so observed.
 - b. Design source intensity of luminaires that may be observed at an elevation of 60 inches (1524 mm) above finished grade from designated "spill-light critical" areas to be less than 12,000 candela when so observed.

4. Determine LLF in accordance with IES RP-6 and manufacturer's test data.
 - a. Use LLD at 90 percent of rated lamp life. LLF shall be applied to initial illumination to ensure that target illumination is achieved at 100 percent of lamp life and shall include consideration of field factor.
 - b. LLF shall not be higher than 90 percent and may be lower when determined by manufacturer after application of the driver output and optical system output in accordance with IES RP-6.
 5. Luminaire-Mounting Height: Comply with IES RP-6 , with consideration for requirements to minimize spill light and glare.
 6. Luminaire Placement: Luminaire clusters shall be outside the glare zones defined by IES RP-6.
- C. Egress Lighting: In case of power failure, provide a minimum of 1.0-fc average illumination, within 30 seconds, measured at grade in spectator and spectator egress areas.
1. Duration of emergency illumination shall be not less than 90 minutes.
 2. Momentary Power Interruptions: Provide emergency illumination immediately following restoration of power to the lighting circuits. Emergency illumination shall automatically extinguish after 90 minutes.
 3. Horizontal light levels shall be 1.0fc, with a minimum of 0.1fc.
 4. Horizontal maximum to minimum uniformity ratio shall be 40:1.
 5. Dimming of the sports field lighting system luminaires to achieve design requirements will NOT be accepted for egress lighting.
 6. All egress luminaires are on a generator.
- D. Lighting Control: Manual, low voltage, or digital; providing the following functions, integrated into a single control station, with multiple subcontrol stations as indicated:
1. Control Station: Key-operated master switch, manual push-button controls, and system status indicator lights. Test switch of egress lighting system.
 2. Light Levels: Two levels of control - 100/50 percent of minimum target illumination.
- E. Electric Power Distribution Requirements:
1. Electric Power: 208 V; three phase, unless noted otherwise on the Drawings.
 - a. Include roughing-in of service indicated for nonsports improvements on Project site.
 - b. Balance load between phases. Install wiring to balance three phases at each support structure.
 - c. Include required overcurrent protective devices and individual lighting control for each sports field or venue.
 - d. Include indicated feeder capacity and panelboard provisions for future lighted sports field construction.
- F. Seismic Performance: Luminaires, ballasts, and support structures shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational after the seismic event."

2.03 LUMINAIRES, LAMPS, AND BALLASTS

- A. Luminaires: Complying with requirements described in Section 265600 "Exterior Lighting"
 - 1. Listed and labeled, by an NRTL acceptable to authorities having jurisdiction, for compliance with UL 1598 for installation in wet locations.
 - 2. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without using tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent their accidental falling during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lens. Designed to disconnect ballast when door opens.
 - 3. Exposed Hardware: Stainless steel latches, fasteners, and hinges.
 - 4. Spill-Light Control Devices: Internal louvers and external baffles furnished by manufacturer and designed for secure attachment to specific luminaire.
- B. Driver Mounting: Grouped in cabinets, remote from location of associated luminaires unless otherwise indicated.

2.04 LIGHTING CONTROLS

- A. LED field lighting shall operate in the "traditional" manner. That is, on/off at a set value during a game.
- B. Contractor is responsible for all necessary conduit, wiring, heating, ventilation, air conditioning, racking, equipment, software, programming, etc. to provide a fully controlled system at the locations indicated.
- C. Wireless controls are NOT permitted.
- D. Lighting shall be staged on one pole at a time per side for game mode applications to reduce power draw.
- E. Remote Control Enclosures:
 - 1. NEMA 250, Type 3R box for outdoor and NEMA 250, Type 12 box for indoor.
 - 2. Remote enclosure shall include galvanized steel hinges, lockable stainless steel latches, gasketing, and water tight wire entry. Each enclosure shall be labeled with location for easy reference and UL listed for 550C ambient operation.
 - 3. Each enclosure will be constructed of a minimum .080" thick 5052-H32 aluminum for high corrosion resistance and thermal conduction and be UL 1598 listed.
 - 4. The enclosure shall be painted.
 - 5. Hinged door in front cover with flush latch and concealed hinge.
 - 6. Key latch. All enclosures to be keyed alike.
 - 7. Metal barriers to separate wiring of different systems and voltage.
 - 8. Enclosures shall be surface mounted
- F. Sports Field luminaires shall be control from two (2) locations:
 - 1. Pressbox: On/Off.
 - 2. Power panel location under visitor stands. On/Off.
 - 3. No dimming will be provided.

2.05 SUPPORT STRUCTURES

- A. Delegated Design: Design of the foundation, poles, luminaire supplemental support framing structure and wind restraints, including comprehensive engineering analysis by a professional Structural Engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Luminaire foundation, pole and supplemental support framing shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated per ASCE 7-10 as a hurricane-prone region.
 - 1. Dead Loads: Luminaires plus all supplemental support framing shall not exceed 130 pounds per luminaire.
 - 2. Wind Loads: Basic Wind Speed of 150 MPH, Exposure Category C, Importance Factor of 0. Category 2.
 - 3. Seismic Loads: Per applicable codes noted above.
 - 4. Ice Loads: Ice Thickness of 0.75 inches, Importance Factor of 1.25.
 - 5. A soil boring report is available upon request.
- C. Minimum thicknesses, gauges and standards:
 - 1. All sheet metal shall have a minimum thickness of 18 gauge.
 - 2. Structural steel members shall have a minimum flange, web or wall thickness of 1/8 inch.
 - 3. All welds exposed to weather shall be continuous for the entire surface of the connection.
 - 4. Where similar connections and members are used in other areas of the stadium, every effort shall be made to detail and furnish members in a consistent and uniform manner.
- D. The fixture shall be securely fastened to the structure and have mounting brackets and a safety cable that is attached to both the fixture and structure.
- E. Mountings, Fasteners, and Appurtenances:
 - 1. Corrosion resistant, compatible with support components, and which shall not cause galvanic action at contact points.
 - a. Steel components shall be galvanized.
 - b. Mounting Hardware Fasteners shall be galvanized or stainless steel.
- F. Accommodate attachments and wiring of other indicated systems.
- G. Pole Shaft: Each pole shaft shall be made of a single ply steel sheet. This steel sheet shall be formed into a tubular shape with one or more longitudinal welds; circumferentially welded splices are not permitted. This tubular shape has a cross-section, which is either multi-sided or round. Multi-sided shall not have a bend radius of less than 2" and do not have a cross-section with less than 12 sides. The material used for these sections shall meet the requirements of ASTM A572 or ASTM A595 Grade-A.
 - 1. Poles exceeding 50 feet in length must be designed as a minimum of two-piece assemblies. These two-piece assemblies are joined together by telescoping the upper section over the lower section and shall be designed to lap a minimum distance of 1.5 times the inside assembly diameter. Each shaft shall have a galvanized coating in accordance with the requirements of ASTM A123 and shall be completely coated inside and out with a single dip. Double dipping shall not be permitted in compliance with USGA (United States Galvanizing Association) recommended practice.

- H. Base plates shall be integrally welded to the bottom pole section with either a telescopic weld or a full penetration weld with a backup bar. All bolt holes shall be circumferentially slotted to allow for + 2.5 degrees rotation for field adjustment. The material used will conform to either ASTM A36 or ASTM A572.
- I. Anchor bolts shall meet the requirements of ASTM F1554, Grade 55. The bolts shall have a minimum threaded length of at least 6 inches and are galvanized for a minimum of 12" on the threaded end to the requirements of ASTM A153. Each bolt shall be supplied with two hex nuts and two flat washers. Each bolt shall have a "hooked" end on the embedded portion to assist in the development of pull-out-strength.
- J. Slip-fit concrete base may be substituted for base plates. Pre-stressed concrete base embedded in concrete backfill allowed to cure for 12-24 hours before pole stress is applied. The concrete for anchor bolt foundations shall be allowed to cure for a minimum of 28 days before the pole stress is applied. Concrete and direct bury poles are not acceptable.
- K. Hand holes shall be peripherally reinforced with a lat bar that is integrally welded to the pole shaft. Each pole shall have a 4" x 6.5" reinforced hand hole located 18" above the finished grade. Cover plates shall be included with all hand holes and must be attached to the pole with a back-bar and screw.
- L. Poles shall be provided with a mechanical ground lug capable of connecting up to #2/0 ground wire. Lug shall be welded to the pole.
- M. All welding shall be performed by AWS (American Welding Society certified welders and all welds comply with the most recent addition of the AWS Structural Welding Code.
- N. Pole structures shall be shipped by truck and shall be firmly secured and packed to assure protection to the structures and finish. Inspect poles upon delivery to ensure poles are not damaged.
- O. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
- P. Drawings indicate a foundation. The Lighting Manufacturer shall provide foundation design for the specific pole heights required or the specified concrete bases. An independent Professional Engineer shall produce foundation designs. Lighting Manufacturer employees will not be allowed to develop foundation designs to protect the owners' interests in regards to safety.
- Q. Soil Conditions: The design criteria for these specifications are based on soil design parameters as outlined in the geotechnical report. It shall be the contractor's responsibility to notify the owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated.
- R. Typical or Rule-of-Thumb foundations will not be acceptable. An independent Professional Engineer per the soil bore test and pole reaction information must design foundations.
- S. Structural Design: Poles should be designed for the combined effects for both wind and dead load.
- T. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole.

- U. Structural Drawings: Project specific support structure, including foundation, poles, support structures and connection drawings shall be designed and stamped by a professional Structural Engineer registered in the jurisdiction of the project.

2.06 POWER DISTRIBUTION AND CONTROL

- A. Wiring Method for Feeders, Subfeeders, Branch Circuits, and Control Wiring: Underground nonmetallic raceway; No. 10 AWG minimum conductor size for power wiring.
- B. Overhead-, pole-, or structure-supported wiring and transformers are not permitted.
- C. Electrical Enclosures Exposed to Weather: NEMA 250, Type 3R enclosure constructed from stainless steel, with hinged doors fitted with padlock hasps or lockable latches.

2.07 SURGE PROTECTION

- A. Surge Protection: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" and include surge suppressors with the following requirements:
 - 1. Panelboard type.
 - 2. Nonmodular, with digital indicator lights and one set of dry contacts.

2.08 GENERAL FINISH REQUIREMENTS

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

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 electrical and communications conduit to verify actual locations of connections before pole or luminaire installation.
- C. Examine foundations for suitable conditions where luminaires will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Erection and handling shall be performed by manufacturer's trained, qualified personnel, utilizing equipment that is designed for handling and erection procedures of this nature, shall perform transportation and handling on job site.

- B. Mount new driver enclosures and controls cabinets in areas shown on drawings. Do not penetrate any roofing. Enclosures and cabinets shall be surface mounted.
- C. Furnish and install mounting hardware.
 - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
 - 2. The enclosures, tower area and mounting hardware shall be galvanized. Touch up as required to damaged areas.
- D. Comply with NECA 1.
- E. Wiring Method: Install cables in raceways, except when cables are installed within boxes and poles. Conceal raceways and cables.
 - 1. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.
- F. Coordination layout and installation of luminaires with other construction.
- G. Use web fabric slings (not chain or cable) to raise and set structural members. Protect equipment during installation to prevent corrosion.
- H. Pole bases installation
 - 1. Install poles and other structural units level, plumb, and square.
 - 2. Pole bases or concrete bases shall be installed per design engineer's documents.
 - 3. All exposed concrete to 0'-6" below grade shall have a smooth trowel finish, less than 1/4" pits or holes.
 - 4. Pole bases shall extend to 0'-6" above grade.
 - 5. All exposed corners shall have a 45 degree chamfer.
 - 6. Grounding rod shall be provided as per drawing details.
- I. Install luminaires at height and aiming angle as indicated on Drawings.
- J. Except for embedded structural members, grout void between pole base and foundation. Use nonshrinking or expanding concrete grout firmly packed in entire void space. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole. Nonshrink grout is specified in Section 055000 "Metal Fabrications."
- K. Install protective pipe bollards on two sides of each embedded pole installed in paved areas. See Section 055000 "Metal Fabrications" for pipe bollards.
- L. Install controls and driver housings in cabinets mounted on support structure at least 10 feet (304.8 cm) above finished grade.

3.03 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.04 FIELD QUALITY CONTROL

- A. Aim sports field lighting luminaires.
- B. Sports Field lighting manufacturer shall provide two (2) eight (8) hour sessions of nighttime aiming and adjustment.
- C. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- D. Perform the following tests and inspections:
 - 1. After installing sports lighting system and after electrical circuits have been energized, perform proof-of-performance field measurements and analysis for compliance with requirements.
 - 2. Playing and Other Designated Areas: Make field measurements at intersections of grids, dimensioned and located as specified in "Performance Requirements" Article and as described below:
 - 3. Make field measurements at established test points in areas of concern for spill light and glare.
 - 4. Perform analysis to demonstrate correlation of field measurements with specified illumination quality and quantity values and corresponding computer-generated values that were submitted with engineered design documents. Submit a report of the analysis. For computer-generated values, use manufacturer's lamp lumens that are adjusted to lamp age at time of field testing.
- E. Correction of Illumination Deficiencies for Playing Areas: Make corrections to illumination quality or quantity, measured in field quality-control tests, that varies from specified illumination criteria by plus or minus 10 percent.
 - 1. Add or replace luminaires; change mounting height and aiming; or install louvers, shields, or baffles.
 - 2. If luminaires are added or mounting height is changed, revise aiming and recalculate and modify or replace support structures if indicated.
 - 3. Do not replace luminaires with units of higher or lower wattage without Architect's approval.
 - 4. Retest as specified above after repairs, adjustments, or replacements are made.
 - 5. Report results in writing.
- F. Correction of Excessive Illumination in Spill-Light-Critical Areas: If measurements indicate that specified limits for spill light are exceeded, make corrections to illumination quantity, measured in field quality-control tests, that reduce levels to within specified maximum values.
 - 1. Replace luminaires; change mounting heights and revise aiming; or install louvers, shields, or baffles.
 - 2. Obtain Architect's approval to replace luminaires with units of higher or lower wattage.
 - 3. If mounting height is changed, revise aiming and recalculate and modify or replace support structures if indicated.
 - 4. Retest as specified above after repairs, adjustments, or replacements are made.
 - 5. Report results in writing.
- G. Sports lighting will be considered defective if it does not pass tests and inspections.
- H. Prepare test and inspection reports.

3.05 ADJUSTING

- A. Adjust luminaires and supports to maintain orientation and aiming as recommended by manufacturer.

3.06 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.

END OF SECTION 26 56 68

SECTION 27 00 00 - TABLE OF CONTENTS - DIVISION 27

SPECIFICATIONS

- 1.01 Division 27 -- Communications
 - A. 27 05 33.13 - Conduit for Communications Systems
 - B. 27 10 00 - Structured Cabling

END OF SECTION 27 00 00

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SECTION 27 05 33.13 - CONDUIT FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Stainless steel rigid metal conduit (RMC).
- C. Galvanized steel intermediate metal conduit (IMC).
- D. Stainless steel intermediate metal conduit (IMC).
- E. Flexible metal conduit (FMC).
- F. Liquidtight flexible metal conduit (LFMC).
- G. Galvanized steel electrical metallic tubing (EMT).
- H. Stainless steel electrical metallic tubing (EMT).
- I. Aluminum electrical metallic tubing (EMT).
- J. Rigid polyvinyl chloride (PVC) conduit.
- K. Liquidtight flexible nonmetallic conduit (LFNC).
- L. High-density polyethylene (HDPE) conduit.
- M. Polyvinyl chloride (PVC) plastic utilities duct.
- N. Inside-plant flexible nonmetallic communications raceway/innerduct.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.
- D. ASTM F512 - Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation; 2019 (Reapproved 2024).
- E. ASTM F2160 - Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD); 2016.

- F. ASTM F2176 - Standard Specification for Mechanical Couplings Used on Polyethylene Conduit, Duct and Innerduct; 2017.
- G. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.
- H. BICSI TDMM - Telecommunications Distribution Methods Manual, 15th Edition; 2024.
- I. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- L. NEMA TC 6&8 - Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installations; 2020.
- M. NEMA TC 7 - Solid-Wall Coilable and Straight Electrical Polyethylene Conduit; 2021.
- N. NEMA TC 9 - Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation; 2020.
- O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- P. TIA-568.0 - Generic Telecommunications Cabling for Customer Premises; 2020e.
- Q. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).
- R. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- S. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- T. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
- U. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- V. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- W. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- X. UL 651A - High Density Polyethylene (HDPE) Conduit; Current Edition, Including All Revisions.
- Y. UL 746C - Polymeric Materials – Use in Electrical Equipment Evaluations; Current Edition, Including All Revisions.
- Z. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- AA. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel; Current Edition, Including All Revisions.

- BB. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- CC. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
- DD. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways; Current Edition, Including All Revisions.
- EE. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with actual type and quantity of cables to be installed.
 - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
 - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
 - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of communications cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Shop Drawings:
 - 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
 - 2. Include proposed locations of roof penetrations and methods for sealing.
- C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE

- A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, TIA-569, BICSI ITSIMM, BICSI TDMM, manufacturers' instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Embedded Within Concrete:
 - 1. Within Slab on Grade: Use rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.
 - 2. Within Slab Above Ground: Use rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.
- D. Concealed Within Hollow Stud Walls: Use electrical metal tubing (EMT).
- E. Concealed Above Accessible Ceilings: Use electrical metal tubing (EMT).
- F. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
- G. Exposed, Interior, Not Subject to Physical Damage: Use electrical metal tubing.
- H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).
 - 1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
 - b. Where exposed below 20 feet (6.1 m) in warehouse areas.
- I. Exposed, Interior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or stainless steel rigid metal conduit (RMC).
 - 1. Locations subject to severe physical damage include, but are not limited to:
 - a. High traffic industrial and warehouse areas where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
 - b. Where exposed below 20 feet (6.1 m) in industrial manufacturing areas.
- J. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- K. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or stainless steel rigid metal conduit (RMC).
 - 1. Exterior locations subject to severe physical damage include, but are not limited to:
 - a. Where exposed to vehicular traffic below 20 feet (6.1 m).

- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
- M. Corrosive Locations Above Ground: Use stainless steel rigid metal conduit (RMC) or stainless steel intermediate metal conduit (IMC).
 - 1. Corrosive locations include, but are not limited to:
 - a. Cooling towers.
 - b. Electroplating operations.
 - c. Swimming pools and associated equipment areas.
 - d. Wastewater treatment facilities.
 - e. Marine environments.
 - f. Chemical storage areas.
- N. Hazardous/Classified Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).
- O. Flexible Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Motorized equipment.

2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70 and TIA-569.
- B. Provide conduit, fittings, supports, and accessories required for complete communications pathway.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.
- D. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
 - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.04 STAINLESS STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC stainless steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6A.
- B. Fittings:
 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A.
 2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
 3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
 4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
 2. Material: Use steel or malleable iron.
 3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
 4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
 - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.06 STAINLESS STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
 2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
 3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
 4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.07 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.08 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
 - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.09 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.
 - 4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
 - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.10 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use stainless steel with corrosion resistance equivalent to conduit.
 - 3. Connectors and Couplings: Use compression/gland or set-screw type.

4. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.11 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.
- B. Fittings:
 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
 2. Material: Use aluminum.
 3. Connectors and Couplings: Use compression/gland or set-screw type.
 - a. Do not use indenter type connectors and couplings.
 4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
 - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.12 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage.
- B. Fittings:
 1. Manufacturer: Same as manufacturer of conduit to be connected.
 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
 3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
 - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.13 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

- A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- B. Fittings:
 1. Manufacturer: Same as manufacturer of conduit to be connected.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for type of conduit to be connected.

2.14 HIGH-DENSITY POLYETHYLENE (HDPE) CONDUIT

- A. Manufacturers:
- B. Description: NFPA 70, Type HDPE high-density polyethylene solid-wall conduit complying with ASTM F2160 and NEMA TC 7; list and label as complying with UL 651A; Schedule 40 unless otherwise indicated.

- C. Joining Methods: Approved by HDPE conduit manufacturer.
- D. Mechanical Fittings: Comply with ASTM F2176; list and label as complying with UL 651A.

2.15 POLYVINYL CHLORIDE (PVC) PLASTIC UTILITIES DUCT

- A. Description: Rigid polyvinyl chloride plastic utilities duct complying with NEMA TC 6&8 and ASTM F512; Type EB-20 listed and labeled as complying with UL 651 suitable for burial with concrete encasement.
- B. Fittings: Comply with NEMA TC 9.
 - 1. Manufacturer: Same as manufacturer of duct to be connected.

2.16 INSIDE-PLANT FLEXIBLE NONMETALLIC COMMUNICATIONS RACEWAY/INNERDUCT

- A. Manufacturers:
- B. Description: Flexible, corrugated, nonmetallic communications raceway and associated fittings listed and labeled as complying with UL 2024; also suitable for installation as innerduct.
- C. Raceway Applications:
 - 1. Plenum Applications: Use listed plenum raceway.
 - 2. Riser Applications: Use listed riser or plenum raceway.
 - 3. General Purpose Applications: Use listed general purpose, riser, or plenum raceway.
- D. Use only with approved cables in accordance with listing.
- E. Color: Orange, unless otherwise indicated.

2.17 ACCESSORIES

- A. Inside-Plant Fabric Innerduct:
 - 1. Listed as complying with UL 2024; plenum rated.
 - 2. Products:
 - a. MaxCell Innerduct; MaxCell Premise: www.maxcell.us/#sle.
- B. Outside-Plant Fabric Innerduct:
 - 1. Designed for installation in underground raceways.
 - 2. Detectable Innerduct:
 - a. Includes integral, magnetic detectable tracer wire, minimum 18 AWG copper.
 - b. Provide NFPA 70 required bonding of metal components in accordance with manufacturer written instructions.
 - 3. Products:
 - a. MaxCell Innerduct; MaxCell Edge: www.maxcell.us/#sle.
- C. Outside-Plant HDPE Innerduct: Smooth interior wall; orange unless otherwise indicated.
 - 1. Products:
 - a. ABB; Carlon; _____
 - b. Blue Diamond Industries, LLC; _____
 - c. Dura-Line; _____

- D. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).
- E. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- F. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- G. Adhesive for HDPE and RTRC Conduit:
 - 1. Specifically designed for bonding dissimilar materials in lieu of transition fittings, including but not limited to polyethylene, fiberglass, PVC, aluminum, and steel; UL 746C recognized.
 - 2. Approved by adhesive manufacturer for use with materials to be joined.
- H. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- I. Foam Conduit Sealant:
 - 1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
 - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 - 3. Rated to hold minimum of 10 ft (3.0 m) water head pressure.
- J. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.
- K. Sealing Systems for Concrete Penetrations:
 - 1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
 - 2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
- L. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- M. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- N. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for conduit/duct arrangement to be installed.
- O. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for casing and conduit/duct arrangement to be installed.

END OF SECTION 27 05 33.13

SECTION 27 10 00 - STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Communications pathways.
- B. Copper cable and terminations.
- C. Fiber optic cable and interconnecting devices.
- D. Communications equipment room fittings.
- E. Communications outlets.
- F. Communications grounding and bonding.
- G. Communications identification.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 270526 - Grounding and Bonding for Communications Systems.
- C. Section 270536 - Cable trays for Communications Systems.
- D. Section 279543 Underground Pathways and Structured for Communication Systems.
- E. Section 27 05 29 - Hangers and Supports for Communications Systems.
- F. Section 27 05 33.13 - Conduit for Communications Systems.
- G. Section 33 71 19 - Electrical Underground Ducts, Ductbanks, and Manholes.

1.03 REFERENCE STANDARDS

- A. ASTM D1002 - Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal); 2010 (Reapproved 2019).
- B. ASTM D1598 - Standard Test Methods for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure; 2021.
- C. ASTM D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings; 2018.
- D. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.
- E. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

- F. FM (AG) - FM Approval Guide; Current Edition.
- G. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.
- H. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2021.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).
- K. TIA-492AAAA - Detail Specification for 62.5-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.
- L. TIA-492AAAB - Detail Specification for 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009a.
- M. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.
- N. TIA-492AAAD - Detail Specification for 850-nm Laser- Optimized, 50-µm Core Diameter/125-µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber; 2009.
- O. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers; 1998 (Reaffirmed 2002).
- P. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak; 2000 (Reaffirmed 2005).
- Q. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 Edition 2: Fibre-Optic Communications Subsystem Test Procedures – Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement; 2015a (Reaffirmed 2022).
- R. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; IEC 61280-4.1 Edition 3.1, Fiber Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant- Multimode Attenuation Measurement; 2023d.
- S. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2024.
- T. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).
- U. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.
- V. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).
- W. TIA-570 - Residential Telecommunications Infrastructure Standard; 2018d.
- X. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).

- Y. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.
- Z. TIA-607 - Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2024e.
- AA. UL (DIR) - Online Certifications Directory; Current Edition.
- BB. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- CC. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- DD. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.
- EE. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.
- FF. UL 2024 - Standard for Cable Routing Assemblies and Communications Raceways; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
 - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Arrange for Communications Service Provider to provide service.
- C. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Sustainable Design Documentation: Submit manufacturer's product data on cable and cable insulation showing compliance with specified lead content requirements.
- D. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
- E. Evidence of qualifications for installer.

- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- G. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.
- H. Field Test Reports.
- I. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
 - 1. Record actual locations of outlet boxes and distribution frames.
 - 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
 - 3. Identify distribution frames and equipment rooms by room number on drawings.
- J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

- A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
- C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
 - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
 - 2. Supervisors and installers factory certified by manufacturers of products to be installed.
 - 3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
 - 1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
 - 2. Comply with Communications Service Provider requirements.
 - 3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
 - 4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
 - 5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. System Description:
 - 1. Provide additional outlets and infrastructure where indicated on drawings.
- C. Main Distribution Frame (MDF): Depreciated Term, refer to Main Cross-connect
- D. Horizontal Cross-connect (HC): A group of connectors, e.g. patch panels, or punch down blocks, that allow horizontal, backbone, and equipment cabling to be cross-connected with patch cords or jumpers. Floor Distributor (FD) is the international equivalent term for HC.
- E. Intermediate Cross-connect (IC): The connection point between a backbone cable that extends from the MC and the backbone cable from the HC. Building Distributor (BD) is the international equivalent term for IC.
- F. Intermediate Distribution Frames (IDF): Depreciated Term, refer to Intermediate Cross-connect
- G. Telecommunications Rooms (TR): A telecommunications space that differs from Equipment Rooms (ER) and Entrance Facilities (EF) in that this space is generally considered a floor-serving or tenant-serving space, as opposed to a campus-serving or building-serving space, that provides a connection point between backbone and horizontal cabling.
- H. Telecommunications Enclosure (TE): A box or cabinet used to house telecommunications equipment and/or cabling terminations. Enclosures are often wall-mounted but are sometimes large enough to be floor-mounted. A TE can sometimes be used in lieu of a TR.
- I. Telecommunications Outlet (TO): An assembly of components consisting of one or more connectors and a faceplate or housing.
- J. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.
- K. Horizontal Cabling: The part of the cabling system that extends from, and includes the work area telecommunications outlet/connector to the HC in the Telecommunications Room

2.02 PATHWAYS

- A. Conduit: See section 27 05 33.13.
- B. Cable Trays: See Section 270536.
- C. Firestop Sleeves:
 - 1. Comply with Division 7 Specifications.
 - 2. Products:
 - a. Fire Rated Cable Pathways: Factory manufactured devices comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:
 - 1) Specified Technologies Inc. (STI) EZ-PATH
 - 2) Hilti Speedd Sleeve
 - 3) 3M Fire Barrier Pass Through Device, Square
 - b. Latex Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:
 - 1) Specified Technologies inc. (STI) SpecSeal Series SSS Sealant
 - 2) Hilti Elastic Firestop Sealant
 - 3) 3M fire Barrier Silicone Sealant
 - c. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable:
 - 1) Specified Technologies Inc. (STI) SpecSeal Series SSP Putty
 - 2) Hilti Firestop Putty
 - 3) 3M Fire barrier Moldable Putty
 - d. Firestop Pillows: Re-entrable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag, the following products are acceptable:
 - 1) Specified Technologies Inc. SpecSeal Series SSB Pillows
 - 2) Hilti firestop Cushions
 - 3) 3M Fire Barrier Pillows

2.03 COPPER CABLE AND TERMINATIONS

- A. Manufacturers:
 - 1. Cable
 - a. Belden
 - b. Berk-Tek
 - c. CommScope; _____
 - d. Panduit
 - e. Superior Essex
 - 2. Termination Hardware
 - a. Commscope
 - b. Leviton
 - c. Ortronics
 - d. Siemon

B. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type - TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
 - a. Data -
3. Cable Capacity: 4-pair.
4. Cable Applications:
 - a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
 - b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
 - c. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.
5. Cable Jacket Color - Blue, unless otherwise directed on the Drawings.
6. Product(s):

C. Jacks and Connectors:

1. Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
2. Performance: 500 mating cycles.
3. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
4. Product(s):
 - a. Category 6 Standards Compliant
 - 1) CommScope UNJ600
 - 2) Leviton Extreme Cat 6
 - 3) Ortronics Cat6 Tech Choice
 - 4) Panduit CJ688T
 - 5) Siemon MX6
 - b. Category 6 Enhanced Performance
 - 1) Commscope MGS400
 - 2) Leviton Atlas-X1 Cat 6
 - 3) Ortronics ClarityTracjack 6
 - 4) Siemon Z6
 - c. Category 6a
 - 1) Commscope MGS600
 - 2) Leviton Extreme Cat 6a
 - 3) Ortronics Clarity Tracjack 6a
 - 4) Panduit CJS6X88T
 - 5) Siemon Z6A

D. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end. Connector shall have snagless design. Product shall be provided by the manufacturer of the copper jacks and connectors.
2. Patch Cords for Patch Panels:
 - a. Quantity: One for each patch panel ports terminated with a Work Area cable.
 - b. Length: 3 feet.
3. Patch Cords for Work Areas:

- a. Quantity: One for each work area outlet port.
 - b. Length: _____ feet (_____ mm) 7 feet
4. Product(s):
 - a. As manufactured by the manufacturer of the copper connector solution being provided and matching the performance parameters of the terminations for which the patch cord is being provided.

2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

- A. Manufacturers:
 1. Berk-Tek Leviton
 2. CommScope
 3. Corning
 4. General Cable
 5. Siemon Company
- B. Provide cables with lead content less than 300 parts per million.
- C. Fiber Optic Backbone Cable:
 1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
 2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
 3. Cable Capacity: Quantity of fibers as indicated on drawings.
 4. Cable Applications:
 - a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
 - b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
 5. Cable Jacket Color:
 - a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
 - b. Multimode Fiber (OM1/OM2): Orange.
 - c. Single-Mode Fiber (OS1/OS2): Yellow.
 6. Environmental Rating
 - a. Indoor
 - b. Outdoor
 - c. Indoor/Outdoor
 7. Performance Rating
 - a. Single Mode: OS2
 - b. Multi-mode: OM4
- D. Fiber Optic Interconnecting Devices:
 1. Connector Type: Type LC.
 2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
 3. Maximum Attenuation/Insertion Loss: 0.3 dB.
 4. Product(s):
 - a. As manufactured by the fiber optic cable manufacturer.
- E. Fiber Optic Patch Cords:
 1. Description: Factory-fabricated 2-fiber cable assemblies with suitable connectors at each end.

2. Patch Cords for Patch Panels:
 - a. Quantity: One for each pair of patch panel ports.
 - b. Length: 3 feet.
3. Product(s):
 - a. As manufactured by the fiber optic cable manufacturer.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:

1. Manufacturers:
 - a. As manufactured by the copper cable jack and termination manufacturer.
2. Connector Blocks for Category 3 Cabling: Type 66 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
3. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
4. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
 - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
 - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
 - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
 - d. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:

1. Manufacturers:
 - a. As manufactured by the fiber optic cable manufacturer.
2. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.
 - a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
 - b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
 - c. Provide incoming cable strain relief and routing guides on back of panel.
 - d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
 - e. Provide dust covers for unused adapters.

C. Backboards: Interior grade plywood without voids, 3/4" thick; UL-labeled fire-retardant.

1. Size: As indicated on drawings 4' x 8', unless otherwise indicated on the Drawings.
2. Do not paint over UL label.

D. Racks and Cabinets:

1. Manufacturers:
 - a. Racks
 - 1) Chatsworth
 - 2) Great Lakes

2. Component Racks: EIA/ECA-310 standard 19 inch wide.
3. ScrewThread:
 - a. 12-24, for all but AV racks and cabinets
 - b. 10-32 for AV racks and cabinets.
4. Color: Black, powder coated factory finish.
5. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.
 - a. Height: 20U minimum, unless noted otherwise on the Drawings.
 - b. Depth: 25", unless noted otherwise on the Drawings.
 - c. Load Rating: 150 lbs minimum, unless noted otherwise on the Drawings
 - d. Stabilizing reinforcement pan at bottom of rack with multiple 3" feed through holes.
6. Floor Mounted Racks, 2 post: Aluminum Extrusion Construction with vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
 - a. Height: 45U, minimum, unless noted otherwise on the Drawings.
 - b. Stile (Vertical member) width: 3" minimum.
 - c. Listing: UL2416.
 - d. Load Rating: 1500 lbs.
7. Floor Mounted Racks, 4 post: Aluminum Extrusion Construction with vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
 - a. Height: 45U, minimum, unless noted otherwise on the Drawings.
 - b. Depth: 32" usable, unless notes otherwise on the Drawings.
 - c. Stile (Vertical member) width: 3" minimum.
 - d. Listing: UL2416.
 - e. Load Rating: 1500 lbs.
8. Cabinets: Steel construction with corrosion resistant finish.
9. Locks: Keyed alike.

E. Cable Management:

1. Manufacturers: As manufacturer by the rack and/or cabinet manufacturer.

2.06 COMMUNICATIONS OUTLETS

A. Manufacturers: Match manufacturer of the copper jacks and terminations.

B. Wall Plates:

1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity: As indicated on the faceplate schedule on the Drawings.
4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 27 26.
5. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified on the drawings.
6. Wall Plate Material/Finish - Flush-Mounted Outlets: High impact thermoplastic, color to be selected.

2.07 GROUNDING AND BONDING COMPONENTS

- A. Comply with TIA-607.
- B. Comply with Section 270526.

2.08 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.
- B. Comply with Section 26 05 53.

2.09 ACCESSORIES

- A. Inside-Plant Fabric Innerduct:
 - 1. Self-Supporting Inside-Plant Fabric Innerduct: See Section 27 05 29.
 - 2. Listed as complying with UL 2024; plenum rated.
 - 3. Products:
 - a. MaxCell Innerduct; MaxCell Premise: www.maxcell.us/#sle.
- B. Outside-Plant Fabric Innerduct:
 - 1. Designed for installation in underground raceways.
 - 2. Detectable Innerduct:
 - a. Includes integral, magnetic detectable tracer wire, minimum 18 AWG copper.
 - b. Provide NFPA 70 required bonding of metal components in accordance with manufacturer written instructions.
 - 3. Products:
 - a. MaxCell Innerduct; MaxCell Edge: www.maxcell.us/#sle.

2.10 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607, NFPA 70 and 270526.
- D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

3.02 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
 - 1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
 - 2. 12 inches (300 mm) from power conduits and cables and panelboards.
 - 3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
 - 4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
 - 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 - 2. Do not over-cinch or crush cables.
 - 3. Do not exceed manufacturer's recommended cable pull tension.
 - 4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
 - 1. In Telecommunications Rooms and Telecommunications Enclosures: 120".
 - 2. At Outlets - Copper: 12"
 - 3. At Outlets - Optical Fiber: 48".
- C. Copper Cabling:
 - 1. Category 6 and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
 - 2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
 - 3. Use T568B wiring configuration.
- D. Fiber Optic Cabling:
 - 1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
 - 2. Support vertical cable at intervals as recommended by manufacturer.
- E. Wall-Mounted Racks and Enclosures:
 - 1. Install to plywood backboards only, unless otherwise indicated.
 - 2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor, unless otherwise noted on Drawings.
- F. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.
- G. Floor-Mounted Enclosures: Connect adjacent cabinets together and remove interior side panels.
- H. Identification:
 - 1. Use machine generated pre printed labels to identify cables at each end.

2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
 1. Inspect cable jackets for certification markings.
 2. Inspect cable terminations for color coded labels of proper type.
 3. Inspect outlet plates and patch panels for complete labels.
 4. Inspect patch cords for complete labels.
- D. Testing - Copper Cabling and Associated Equipment:
 1. Test backbone cables after termination but before cross-connection.
 2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
 3. Test operation of shorting bars in connection blocks.
 4. Category 3 Backbone: Perform attenuation test.
 5. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.
 6. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
 7. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
- E. Testing - Fiber Optic Cabling:
 1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
 2. Multimode Backbone: Perform tests in accordance with TIA-526-14.
 3. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
 4. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.
- F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION 27 10 00

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SECTION 31 22 01 - FIELD GRADING

PART 1 – GENERAL

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. SECTION INCLUDES:

1. REMOVAL OF TOPSOIL AND STOCKPILING FOR LATER REUSE AND REMOVAL OF EXCESS FROM THE SITE.

2. REMOVAL OF SUBSOIL AND STOCKPILING FOR LATER REUSE AND REMOVAL OF EXCESS FROM THE SITE.

3. GRADING AND FILL OPERATIONS FOR THE SITE.

4. FINISH GRADING WITH TOPSOIL TO PROPOSED CONTOURS.

B. RELATED SECTIONS:

1. SECTION 312333 – TRENCHING AND BACKFILLING

2. SECTION 329210 – SYNTHETIC TURF PLAYING FIELD SYSTEM SUBSURFACE DRAINAGE AND AGGREGATE BASE

1.03 REFERENCES

A. ASTM INTERNATIONAL:

1. STANDARD TEST METHOD FOR SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C-136-96A).

2. STANDARD TEST METHODS FOR LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING STANDARD EFFORT (12,400 FT-LBF/FT³ (600 KN-M/M³)) (ASTM D-698-00A).

3. STANDARD TEST METHOD FOR DENSITY AND UNIT WEIGHT OF SOIL IN PLACE BY THE SAND-CONE METHOD (ASTM D-1556-00).

4. STANDARD TEST METHODS FOR LABORATORY COMPACTION CHARACTERISTICS OF SOIL USING MODIFIED EFFORT (56,000 LB-LBF/FT³ (2,700 KN-M/M³)) (ASTM D-1557-00).

5. STANDARD PRACTICE FOR CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES (UNIFIED SOIL CLASSIFICATION SYSTEM) (ASTM D-2487-00).

6. STANDARD TEST METHODS FOR DENSITY OF SOIL AND SOIL-AGGREGATE IN PLACE BY NUCLEAR METHODS (SHALLOW DEPTH) (ASTM D-2922-96E1).

7. STANDARD TEST METHOD FOR WATER CONTENT OF SOIL AND ROCK IN PLACE BY NUCLEAR METHODS (SHALLOW DEPTH) (ASTM D-3017-96E1).

8. STANDARD TEST METHODS FOR MINIMUM INDEX DENSITY AND UNIT WEIGHT OF SOILS AND CALCULATION OF RELATIVE DENSITY (ASTM D-4254-00).

1.04 SUBMITTALS

A. QUALITY CONTROL SUBMITTALS (TEST REPORTS): SUBMIT THE FOLLOWING IN ACCORDANCE WITH THE GENERAL REQUIREMENTS:

1. FIELD DENSITY TEST REPORTS.

2. REPORT OF ACTUAL UNCONFINED COMPRESSIVE STRENGTH AND/OR RESULTS OF BEARING TESTS OF EACH STRATUM TESTED.

B. CONTRACT CLOSEOUT SUBMITTALS (PROJECT RECORD DOCUMENTS): ACCURATELY RECORD HORIZONTAL DIMENSIONS, ELEVATIONS OR INVERTS, AND SLOPE GRADIENTS OF THE FOLLOWING:

1. UTILITIES TO REMAIN IN PLACE.

2. REROUTED UTILITIES.

3. NEW UTILITIES.

1.05 PROJECT CONDITIONS

A. EXISTING CONDITIONS: FOR REFERENCE ONLY, A TOPOGRAPHIC SURVEY OF THE SITE HAS BEEN INCLUDED ON THE DRAWINGS.

PART 2 – PRODUCTS

2.01 MATERIALS

A. EXISTING TOPSOIL: NATURAL, FERTILE AGRICULTURAL SOIL CAPABLE OF SUSTAINING VIGOROUS PLANT GROWTH, NOT IN FROZEN OR MUDDY CONDITION, CONTAINING NOT LESS THAN SIX PERCENT ORGANIC MATTER, AND CORRECTED TO PH VALUE OF 5.5 TO 7.5. FREE FROM SUBSOIL, SLAG, CLAY, STONES, LUMPS, LIVE PLANTS, ROOTS, STICKS, CRABGRASS, COUCHGRASS, NOXIOUS WEEDS, AND FOREIGN MATTER.

B. SUBSOIL: EXCAVATED MATERIAL, GRADED FREE OF LUMPS LARGER THAN 4 INCHES, ROCKS LARGER THAN 2 INCHES.

C. STRUCTURAL FILL: FILL MATERIALS REQUIRED TO ACHIEVE DESIGN GRADES UNDERNEATH FIELD AREAS SHALL BE COMPOSED OF THE FOLLOWING CHARACTERISTICS. REFER TO GEOTECH REPORT PROVIDED BY ELLIS 7 ASSOCIATES, INC. DATED 2-12-26 FOR FILL MATERIAL RECOMMENDATIONS AND MATERIAL PROPERTIES.

2.02 SOURCE QUALITY CONTROL

A. PERFORM TEST AND ANALYSIS OF FILL MATERIALS PER ASTM D-698 FOR COHESIVE MATERIALS AND ASTM D-4254 FOR COHESIONLESS SOILS AND IN ACCORDANCE WITH DIVISION 1 – GENERAL REQUIREMENTS.

PART 3 – EXECUTION

3.01 EXAMINATION

A. INSPECT THE SITE AND VERIFY AS TO ACTUAL GRADES AND LEVELS, AND THE TRUE CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED.

3.02 PREPARATION

43.01 A. Locate and verify all underground utilities.

43.02 B. Contact Sunshine (811) at least 72 hours before digging.

43.03 1. Notify owners of underground utilities who are not current members of Sunshine three (3) working days in advance.

C. PROTECTION:

1. PROTECT TREES, SHRUBS, LAWNS AND OTHER FEATURES REMAINING AS PORTION OF FINAL LANDSCAPING.

2. PROTECT BENCHMARKS, EXISTING STRUCTURES, FENCES, ROADS, SIDEWALKS, PAVING AND CURBS FROM EQUIPMENT AND VEHICULAR TRAFFIC.

3. MAINTAIN AND PROTECT UTILITIES THAT PASS THROUGH WORK AREA AND ARE INDICATED TO REMAIN:

A. IDENTIFY AND FLAG AERIAL AND SURFACE UTILITIES.

B. IDENTIFY KNOWN UNDERGROUND UTILITIES. STAKE AND FLAG LOCATIONS.

C. WHERE UNMARKED UTILITIES ARE UNCOVERED WITHIN THE WORK AREA, NOTIFY THE ENGINEER AND THE AUTHORITIES HAVING JURISDICTION (AHJ), AND TAKE PRECAUTIONS TO PREVENT INTERRUPTION OF SERVICE. SHOULD SUCH LINES OR SERVICES BE DAMAGED, BROKEN, OR INTERRUPTED THROUGH NEGLIGENCE, REPAIR AND RESTORE IMMEDIATELY WITHOUT ADDITIONAL COST TO UTILITY OWNER.

4. REPAIR DAMAGE CAUSED BY THE WORK OF THIS SECTION.

5. IDENTIFY REQUIRED LINES, LEVELS, CONTOURS, AND DATUM.

6. NOTIFY UTILITY COMPANY WHEN REMOVING AND/OR RELOCATING EXISTING UTILITIES.

7. IF CONDITIONS ARE ENCOUNTERED THAT ARE DIFFERENT THAN THOSE INDICATED ON THE DRAWINGS, NOTIFY THE ENGINEER AND DISCONTINUE AFFECTED WORK IN AREA UNTIL NOTIFIED TO RESUME WORK.

3.03 CONSTRUCTION

A. TOPSOIL STRIPPING:

1. PRIOR TO MASS EARTHWORK EXCAVATION, STRIP ALL TOPSOIL FROM AREAS WHICH WILL RECEIVE PAVING, WALKS, NATURAL GRASS, SYNTHETIC TURF SYSTEMS OR OTHER IMPERVIOUS SURFACING. REMOVE TOPSOIL, VEGETATION, ROOTS, SOFT, ORGANIC, FROZEN, OR UNSUITABLE SOILS IN THE CONSTRUCTION AREA.

2. STOCKPILE TOPSOIL IN STORAGE PILES WHERE DIRECTED BY THE OWNER/SITE CIVIL ENGINEER. CONSTRUCT STORAGE PILES TO FREELY DRAIN SURFACE WATER. COVER STORAGE PILES IF REQUIRED TO PREVENT WIND-BLOWN DUST.

3. DISPOSE OF TOPSOIL IN EXCESS OF THAT NEEDED FOR FINISH GRADING OFF THE SITE.

B. SUBGRADE COMPACTION AND PROOF ROLLING

1. PRIOR TO FILL AND GRADING OPERATIONS, THE CONTRACTOR SHALL SCARIFY AND COMPACT THE SUBGRADE IN FIELD AREAS TO AT LEAST 98% OF THE MATERIALS' STANDARD PROCTOR MAXIMUM DRY DENSITY, IN GENERAL ACCORDANCE WITH ASTM PROCEDURES, TO A DEPTH OF AT LEAST TWELVE INCHES BELOW THE SURFACE AND THEN PROOF-ROLLED WITH A LOADED TANDEM AXLE DUMP TRUCK OR SIMILAR HEAVY RUBBER TIRED VEHICLE.

2. SUBGRADE COMPACTION SHOULD BE COMPACTED AND/OR STABILIZED BEFORE PROOF ROLLING OPERATIONS.

3. PROOF-ROLLING OPERATIONS SHALL BE PERFORMED UNDER A PERIOD OF DRY-WEATHER AND BE WITNESSED BY A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER OF RECORD.

A. SOILS THAT ARE OBSERVED TO RUT OR DEFLECT EXCESSIVELY (>1") UNDER THE MOVING LOAD SHOULD BE UNDERCUT AND REPLACED WITH PROPERLY COMPACTED LOW PLASTICITY FILL MATERIAL.

C. ROUGH GRADING:

1. SET ALL REQUIRED GRADING STAKES. CHECK AND VERIFY CORRECTNESS.

2. PERFORM ALL EXTERIOR CUT, FILL, BACKFILL AND GRADING AS REQUIRED TO CONFORM TO EXISTING CONTOURS AND ELEVATIONS ON THE DRAWINGS. HOLD ROUGH GRADES BELOW FINISH GRADES AS FOLLOWS:

A. AREAS TO RECEIVE NATURAL AND SYNTHETIC TURF PLAYING SYSTEMS: TO BOTTOM OF PROPOSED BASE LAYER.

3. DISPOSE EXCAVATED MATERIAL IN EXCESS OF THAT NEEDED FOR FILL OFF THE SITE OR AS DIRECTED BY THE OWNER/SITE CIVIL ENGINEER. PROVIDE ADDITIONAL FILL EQUIVALENT TO THAT OBTAINED ON THE SITE AND WHICH MEETS SPECIFIED MATERIAL. INSTALL IN LAYERS NOT EXCEEDING 6 INCHES OR OF A THICKNESS DETERMINED BY THE TESTING SERVICE AS REQUIRED TO ACHIEVE PROPER COMPACTION AND MOISTEN ONLY TO OBTAIN THE SPECIFIED DEGREE OF COMPACTION.

D. PAVEMENT SUBBASE COURSE:

1. GENERAL: SUBBASE COURSE CONSISTS OF PLACING SUBBASE MATERIAL, IN LAYERS OF SPECIFIED THICKNESS, OVER SUBGRADE TO SUPPORT A PAVEMENT BASE COURSE.

2. GRADE CONTROL: DURING CONSTRUCTION, MAINTAIN LINES AND GRADES INCLUDING CROWN AND CROSS-SLOPE OF SUBBASE COURSE.

3. SHOULDERS: PLACE SHOULDERS ALONG EDGES OF SUBBASE COURSE TO PREVENT LATERAL MOVEMENT. CONSTRUCT SHOULDERS OF ACCEPTABLE SOIL MATERIALS, PLACED IN SUCH QUANTITY TO COMPACT TO THICKNESS OF EACH SUBBASE COURSE LAYER. COMPACT AND ROLL AT LEAST A 12-INCH WIDTH OF SHOULDER SIMULTANEOUSLY WITH COMPACTING AND ROLLING OF EACH LAYER OF SUBBASE COURSE.

4. PLACING: PLACE SUBBASE COURSE MATERIAL ON PREPARED SUBGRADE IN LAYERS OF UNIFORM THICKNESS, CONFORMING TO INDICATED CROSS-SECTION AND THICKNESS. MAINTAIN OPTIMUM MOISTURE CONTENT FOR COMPACTING SUBBASE MATERIAL DURING PLACEMENT OPERATIONS.

5. WHEN A COMPACTED SUBBASE COURSE IS INDICATED TO BE 6 INCHES THICK OR LESS, PLACE MATERIAL IN A SINGLE LAYER. WHEN SHOWN TO BE MORE THAN 6 INCHES THICK, PLACE MATERIAL IN EQUAL LAYERS, EXCEPT NO SINGLE LAYER MORE THAN 6 INCHES OR LESS THAN 3 INCHES IN THICKNESS WHEN COMPACTED.

E. FILL OPERATIONS AND COMPACTION:

1. STRUCTURAL FILL MATERIALS TO BE PLACED IN MAXIMUM LOOSE LIFTS OF 4 TO 6 INCHES WHEN HAND-GUIDED COMPACTED EQUIPMENT, AND MAXIMUM LOOSE LIFTS AND COMPACTED TO THE REQUIREMENTS LISTED BELOW.

2. COMPACT SOIL TO NOT LESS THAN THE FOLLOWING PERCENTAGES OF MAXIMUM DENSITY FOR SOILS THAT EXHIBIT A WELL-DEFINED MOISTURE DENSITY RELATIONSHIP (COHESIVE SOILS) DETERMINED PER ASTM D-698; AND NOT LESS THAN THE FOLLOWING PERCENTAGES OF RELATIVE DENSITY, DETERMINED PER ASTM D-4254 FOR SOILS THAT WILL NOT EXHIBIT A WELL-DEFINED MOISTURE-DENSITY RELATIONSHIP (COHESIONLESS SOILS):

A. SYNTHETIC TURF PLAYING FIELD SYSTEMS: COMPACT TOP 6 INCHES AND LAYER OF BACKFILL OR FILL MATERIALS TO AT LEAST 98 PERCENT OF THE MATERIALS' STANDARD PROCTOR MAXIMUM DRY DENSITY.

B. NATURAL TURF PLAYING FIELD SYSTEMS: COMPACT TOP 6 INCHES AND LAYER OF BACKFILL OR FILL MATERIALS TO AT LEAST 95 PERCENT OF THE MATERIALS' STANDARD PROCTOR MAXIMUM DRY DENSITY.

F. SHAPING:

1. AFTER GRADING IS COMPLETED, DRAG AND FLOAT SURFACE TO REMOVE RIDGES, DEPRESSIONS, AND OTHER IRREGULARITIES.

2. RAKE OUT AND REMOVE ALL ROOTS, DEBRIS AND STONES LARGER THAN 1 1/2 INCHES.

G. SITE TOLERANCES:

84.01 1. Perform earthwork operations to establish required elevations and dimensions within the following tolerances at points taken on a grid of the specified dimensions. Results that rely on average values will be grounds for rejection of the installation.

- A. a. Exception: No tolerance will be permitted that would allow:
1. 1) A lesser size than indicated for footings and foundations.
 2. 2) A lesser thickness than indicated for:
 - a. a. Paving
 - b. b. Paving base course.
 - c. c. Concrete floor slabs-on-grade.

84.02 2. Under Natural Grass and Synthetic Turf Playing Field System Areas: Plus 0 inch or minus 1/2 inch at points taken on a 25-foot grid.

H. DEWATERING:

1. PREVENT SURFACE WATER AND SUBSURFACE OR GROUNDWATER FROM FLOWING INTO EXCAVATIONS AND FROM FLOODING THE SITE AND THE SURROUNDING AREAS.

2. DO NOT ALLOW WATER TO ACCUMULATE IN EXCAVATIONS. REMOVE WATER TO PREVENT SOIL CHANGES DETRIMENTAL TO STABILITY OF SUBGRADES. PROVIDE AND MAINTAIN PUMPS, WELL POINTS, SUMPS, SUCTION AND DISCHARGE LINES, AND OTHER DEWATERING SYSTEM COMPONENTS NECESSARY TO CONVEY WATER AWAY FROM EXCAVATIONS.

3. ESTABLISH AND MAINTAIN TEMPORARY DRAINAGE DITCHES AND OTHER DIVERSIONS OUTSIDE EXCAVATION LIMITS TO CONVEY RAINWATER AND WATER REMOVED FROM EXCAVATIONS TO COLLECTING OR RUN-OFF AREAS. DO NOT USE TRENCH EXCAVATIONS AS TEMPORARY DRAINAGE DITCHES.

3.04 FIELD QUALITY CONTROL

A. THE CONTRACTOR SHALL EMPLOY AND PAY FOR SOIL TESTING AND INSPECTION SERVICE FOR QUALITY CONTROL TESTING DURING EARTHWORK OPERATIONS IN ACCORDANCE WITH DIVISION 1 – GENERAL REQUIREMENTS. ALLOW TESTING SERVICE TO INSPECT AND APPROVE SUBGRADES AND FILL LAYERS BEFORE FURTHER CONSTRUCTION WORK IS PERFORMED.

1. TESTING FREQUENCY OF STANDARD PROCTOR, MINIMUM % DRY DENSITY, AND PLACEMENT MOISTURE CONTENT RANGE SHALL BE PERFORMED IN THE FOLLOWING INTERVALS.

A. STRUCTURAL FILL (GRANULAR): 1 PER 5,000 SQFT OF
FILL PLACED/LIFT

B. UTILITY TRENCH BACKFILLING: 1 PER 150 LINEAR FOOT/LIFT

B. IF TESTS INDICATE WORK DOES NOT MEET SPECIFIED REQUIREMENTS, REMOVE
WORK, REPLACE AND RE-TEST AT NO ADDITIONAL COST TO THE OWNER.

3.05 ADJUSTING

A. REPAIR AND RE-ESTABLISH GRADES IN SETTLED, ERODED, OR RUTTED AREAS:

1. WHERE COMPLETED COMPACTED AREAS ARE DISTURBED BY SUBSEQUENT
CONSTRUCTION OPERATIONS OR ADVERSE WEATHER, REMOVE AND REPLACE OR
SCARIFY SOIL MATERIALS, RESHAPE, AND RE-COMPACT TO SPECIFIED DENSITY PRIOR
TO FURTHER CONSTRUCTION.

2. WHERE SETTLING IS MEASURABLE OR OBSERVABLE AT EXCAVATED AREAS DURING
GENERAL WARRANTY PERIOD FOR THE PROJECT, REMOVE SURFACE (LAWN, OR OTHER
FINISH), ADD BACKFILL MATERIAL, COMPACT, AND REPLACE SURFACE TREATMENT.
RESTORE APPEARANCE, QUALITY, AND CONDITION OF SURFACE OR FINISH TO MATCH
ADJACENT WORK, AND ELIMINATE EVIDENCE OF RESTORATION TO GREATEST EXTENT
POSSIBLE.

3.06 PROTECTION

A. PROTECT GRADED AREAS FROM TRAFFIC AND EROSION.

END OF SECTION 31 22 01

SECTION 31 23 16 - EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavation for paving, drainage, and landscaping of parking lot.

1.02 SITE CONDITIONS

- A. Traffic: Do not interfere with or close public ways without permission of governing authorities. Do not interfere with adjacent private facilities.
- B. Site Utilities:
 - 1. Advise utility companies of excavation activities before starting excavations. Locate and identify underground utilities passing through work area before starting work.
 - 2. If underground utilities are encountered in locations other than indicated, immediately advise utility owners before proceeding. Amend project record documents to show actual locations.
 - 3. Protect existing utilities indicated to remain.
 - 4. Do not interrupt existing utilities without advance notice to and written approval from the owner.

1.03 RELATED SECTIONS

- A. Section 31 22 13 - Rough Grading

1.04 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.

1.05 SUBMITTALS

- A. Submit in accordance with Division 1 requirements.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum.

- B. Provide markers indicating limits of work and clear identification of items and areas requiring protection.
- C. Provide barricades, warning signs, and warning lights around open excavations as necessary to prevent injury to persons.
- D. The contractor is solely responsible for determining the potential for injury to persons and damage to property.

3.02 EXCAVATION

- A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.
- B. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving, site structures and construction operations.
- C. The Contractor shall perform all excavation of every description and of whatever substances encountered, to the dimensions required for construction and as specified herein.
- D. Excavation Stabilization: Slope faces of excavations to maintain stability in compliance with requirements of governing authorities. Excavation for the structures shall be sufficient to provide a clearance between their outer surfaces and the face of the excavation, sheeting, or bracing (if required), of not less than two (2) feet. Materials encountered in the excavation which have a tendency to slough or flow into the excavation, undermine the banks, weaken the overlying strata, or are otherwise rendered unstable by the excavation operation shall be retained by sheeting, stabilization, grouting or other approved methods. Excavation for precast or prefabricated structures will not be required to be dewatered.
- E. Excavation for the precast or prefabricated structures shall be carried to an elevation one (1) foot lower than the proposed outside bottom of the structure to provide space for the select backfill material. Prior to placing the select backfill, the excavation shall be sounded, if not dewatered, using a rigid pole to indicate to the satisfaction of the Engineer that the excavation has been carried to the proper depth and is reasonably uniform over the area to be occupied by the structure.
- F. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavations shall be replaced with Class B concrete (refer to Section 32 13 10).
- G. Footings: Cast-in-place concrete footing sides shall be formed immediately after excavation. Forming for footing sides is specified elsewhere.
- H. Machine slope banks to angle of repose or less, until shored.
- I. Excavation cut not to interfere with normal bearing splay of building foundation.
- J. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- K. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

- L. Unnecessary Excavation: The expense of excavation of materials outside of limits indicated or ordered in writing by the Engineer and the correction thereof to the satisfaction of the Engineer shall be borne by the contractor.
 - 1. Unnecessary excavation under footings: Either deepen footings to bear on actual subgrade elevation without changing top elevations or place concrete fill up to required elevation, as required by the Engineer.
 - 2. Unnecessary excavation other than under footings:
 - a. Either place compacted fill or otherwise correct conditions, as required by the architect.
- M. Excavation for Structures:
 - 1. Excavate beyond footings and foundations so as to allow proper construction and inspection of concrete formwork and other materials. Excavate to the required elevation.
 - a. Tolerance: Plus, or minus 1 inch.
- N. Excavation for Footings and Foundations:
 - 1. Delay excavation to final grade and final compaction until just before concrete will be placed.
 - 2. Remove any loose or sloughed material and adjust excavations to conform to required lines, grades, and tolerances and to form a suitable bearing surface. Do not disturb bottom of completed excavations.
- O. Approval of Subgrade: Notify the Engineer when required elevations have been reached.
 - 1. When required by the Engineer due to the unforeseen presence of unsatisfactory materials or other factors, perform additional excavation and replace with approved compacted fill material in accordance with the Engineer's instructions.
 - 2. Payment for unforeseen additional work will be made in accordance with established unit prices or, if none, in accordance with provisions for changes in the work. No payment will be made for correction of subgrades improperly protected against damage from freeze-thaw or accumulation of water, or for correction of otherwise defective subgrades.
- P. Dewatering: Any water which accumulates in the excavations for structures, pipes, and utilities, shall be removed promptly by well point system or by other means satisfactory to the Engineer in such a manner as to not create a nuisance to adjacent property or public thoroughfare. Pumps and engines for well point systems shall be operated with mufflers and at a minimum noise level suitable to a residential area. The Contractor shall be responsible for any nuisance created due to the disposal of water from his dewatering system.
- Q. Stockpiled Materials: Materials removed from the excavation shall be stored and disposed of in a manner which will not interfere with traffic at the site. Material suitable for backfill not needed for backfill at the structure but needed elsewhere shall be stockpiled until moved and used elsewhere. Material unsuitable for use in backfill shall become the property of the Contractor and shall be removed and disposed of by the Contractor at the Contractor's expense immediately after backfill is placed.

3.03 FIELD QUALITY CONTROL

- A. Testing Laboratory Services:
 - 1. The owner will secure and pay for the services of a Geotechnical Engineer to classify existing soil materials, to recommend and to classify proposed borrow materials when necessary, to verify compliance of materials with specified requirements, and to perform required field and laboratory testing.

3.04 PROTECTION

- A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

END OF SECTION 31 23 16

SECTION 31 23 19 - DEWATERING AND BEDDING

PART 1 – GENERAL N/A

PART 2 - PRODUCTS N/A

PART 3 – EXECUTION

- 3.01 It is the Contractor's responsibility to determine the extent of dewatering necessary and include the cost of such work in the Base Bid.
- 3.02 Prevent surface water and subsurface or ground water from flowing into excavations and from flooding the project site and surrounding area.
- 3.03 In no event shall the contractor allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms and soil changes detrimental to the stability of subgrades. Provide and maintain dewatering system components necessary to convey water away from excavations.
- 3.04 Any water which accumulates in the excavations for structures, pipes, and utilities, shall be removed promptly by well point system or by other means satisfactory to the Engineer in such a manner as to not create a nuisance to adjacent property or public thoroughfare. Pumps and engines for well point systems shall be operated with mufflers and at a minimum noise level suitable to a residential area. The Contractor shall be responsible for any nuisance created due to the disposal of water from his dewatering system.
- 3.05 All excavations or trenches of 4' or deeper shall be appropriately benched, shored, or sloped according to the procedures and requirements set forth in OSHA's Excavation standard, 29 CFR 1926.650, .651, and .652.
- 3.06 DEWATERING
- 3.07 A. Provide an adequate system to lower and control groundwater in order to permit excavation, construction of structures, and placement of fill materials under dry conditions. Install sufficient dewatering equipment to pre-drain water bearing strata above and below bottom of structure foundations, drains, sewers, and other excavations.
- 3.08 B. Reduce hydrostatic head in water-bearing strata below structure foundations, drains, sewers and other excavations to extent that water level and piezo metric water levels in construction areas are below prevailing excavation surface.
- A. Maintain piezo metric water level a minimum of 2-feet below surface of excavation.

- 3.09 C. Prior to excavation below groundwater level, place system into operation to lower water levels as required and then operate it continuously 24 hours a day, 7 days a week until drains, sewers and structures have been constructed, including placement of fill materials, and until dewatering is no longer required.
- 3.10 D. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner to avoid inconvenience to others engaged in work about site. Provide sumps, sedimentation tanks, and other flow control devices as required by governing authorities.
- 3.11 E. Provide standby equipment on site, installed and available, for immediate operation if required to maintain dewatering on a continuous basis in event any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform work as may be required to restore damaged structures and foundation soils at no additional expense.
- 3.12 BEDDING
- 3.13 The bottom of the trenches shall be excavated to a depth 6 inches below the outside bottom of the pipe barrel. The resulting excavation shall be backfilled with pipe bedding material up to the level of the lower one-third of the proposed pipe barrel. This backfill material shall be tamped and compacted to provide proper bedding for the pipe and shall then be shaped to receive the pipe.
- 3.14 Bell holes and depressions for joints shall be dug after the trench bottom has been graded and in order that the pipe rest upon the prepared bottom for as nearly its full length as practicable, shall be only of such length, depth, and width as required for properly making the particular type of joint.

END OF SECTION 31 23 19

SECTION 31 2 3 33 - TRENCHING AND BACKFILL

TRENCHING AND BACKFILL

PART 1 GENERAL

2.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section, including but not limited to - the following.
 - 1. Document 31 22 01 – FIELD GRADING
 - 2. Document 33 40 00 – STORM DRAINAGE UTILITIES
 - 3. Trench excavation width and safety.
 - 4. Backfill materials and placement for underground utilities.
 - 5. Utility identification using marking tape and trace wire.

2.02 SUMMARY

- A. Section Includes:
 - 1. Trench excavation width and safety.
 - 2. Backfill materials and placement for underground utilities.
 - 3. Utility identification using marking tape and trace wire.

2.03 REFERENCES

- A. American Public Works Association (APWA):
 - 1. Public Works Management Practices Manual; latest edition.
- B. ASTM International (ASTM):
 - 1. C33: Specification for Concrete Aggregates.
 - 2. C150: Standard Specification for Portland Cement.
 - 3. C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - 4. D75: Standard Practice for Sampling Aggregates.
 - 5. D421: Practice for Dry Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants.
 - 6. D422: Test Method for Particle-Size Analysis of Soils.
 - 7. D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).
 - 8. D1556: Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 9. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft³ (600 kN-m/m³)).
 - 10. D2167: Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

11. D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
12. D2419: Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
13. D2434: Standard Test Method for Permeability of Granular Soils (Constant Head).
14. D2487: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
15. D2488: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
16. D2940/D2940M: Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.
17. D4318: Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
18. D4832: Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
19. D6938: Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

- C. Occupational Safety and Health Administration (OSHA) Standards and Regulations:
1. 29 CFR 1926, Subpart P: Safety and Health Regulations for Construction, Excavations.

2.04 CLASSIFICATION OF EXCAVATION

- A. As specified in Section 31 20 01 – FIELD GRADING

2.05 DEFINITIONS

- A. Percent Compaction or Compaction Density: The field dry density of compacted material, expressed as a percentage of the maximum dry density.
- B. Field Dry Density or Field Density: In-place density as determined by ASTM D1556 (Sand Cone Method), ASTM D2167 (Rubber Balloon Method), or ASTM D6938 (Nuclear Method).
- C. Maximum Dry Density: Laboratory density as determined by ASTM D698 (Standard Proctor) and occurring at the optimum moisture content of the soil being tested.
- D. Pipe Embedment: Comprised of the following or combination thereof:
1. Foundation: Required only when the native trench bottom does not provide a firm working platform or the necessary uniform and stable support for the installed pipe.
 2. Bedding: Placed directly underneath the pipe and brings the trench bottom to grade. Provides a firm, stable, and uniform support of the pipe.
 3. Haunching: From bottom of pipe to springline.
 4. Initial Backfill: From top of bedding or foundation to six inches above top of pipe, unless noted otherwise.
 5. Final Backfill: Above the initial backfill to the original or finish grade.
 6. Backfill: Includes initial and final backfill.

2.06 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, Submittal Procedures.
- B. Materials Sources: Name of source, location, date of sample, sieve analysis, and laboratory compaction characteristics.

2.07 QUALITY ASSURANCE

- A. Responsibilities by CONTRACTOR:
 - 1. The CONTRACTOR shall compact backfill material in accordance with the specifications.
- B. Responsibilities of Owner:
 - 1. The Owner shall provide quality control acceptance field testing services of compacted backfill material, unless noted otherwise.
 - 2. The Owner's representative will take tests along backfilled area if compaction tests indicate a failure to meet the specified compaction requirements.

2.08 DELIVERY STORAGE AND HANDLING

- A. Provide Mirafi 140N geotextile fabric or approved equal meeting the following requirements:

TENSILE STRENGTH	120 LBS.
ELONGATION AT BREAK	50 %
MULLEN BURST	225 PSI
PUNCTURE STRENGTH	310 LBS.
TRAPEZOIDAL TEAR	50 LBS.
APPARENT OPENING	70 US SIEVE
PERMITTIVITY	1.7 SEC-1
UV RESISTANCE RETAINED	70%
FLOW RATE	135 G/M/SF

- B. Protect geotextile fabric from sunlight during transportation and storage. Do not leave geotextile fabric exposed to sunlight for more than five days during installation operations.

2.09 SITE CONDITIONS

- A. A Geotechnical Data Report was prepared for this Project and is provided with the Contract Documents.

PART 2 PRODUCTS

3.01 BACKFILL MATERIALS

- A. Materials as specified in Section 31 22 01 – FIELD GRADING, and indicated on Contract Drawings.

3.02 EQUIPMENT

- A. Compaction equipment shall be capable of consistently achieving the specified compaction requirements without damaging pipes.

3.03 UTILITY IDENTIFICATION

- A. Trace Wire: Continuous, single-strand copper wire, insulated, maximum 10 AWG. Clear plastic covering, imprinted with inscription describing specific utility in large letters.
- B. Marking Tape: Use type specifically manufactured for marking and locating underground utilities. Acid- and alkali-resistant polyethylene film, six inches wide with minimum thickness of 0.004 inch, minimum strength of 1,750 psi lengthwise and 1,500 psi crosswise. Provide tape manufactured with foil core at least 0.35-mil thick to enable detection by metal detection when tape is buried up to three feet deep. Tape shall bear continuous printed inscription describing specific utility. Tape shall be installed 12 inches below finished grade. Tape color shall be as follows:
 - 1. Electric conduits, duct banks, and cable: Red.
 - 2. Potable water systems: Blue.
 - 3. Non-potable water (NPW) systems: Purple.
 - 4. Gas, oil, dangerous materials: Yellow.
 - 5. Telephone, Fiber Optic, CCTW, fire communications: Orange.
 - 6. Sanitary sewer systems: Green.

PART 3 EXECUTION

4.01 EXAMINATION

- A. As specified in Section 31 22 01 - FIELD GRADING.

4.02 PREPARATION

- A. As specified in Section 31 22 01 – FIELD GRADING

4.03 PROTECTION OF IN-PLACE CONDITIONS

- A. As specified in Section 31 22 01 – FIELD GRADING.

4.04 RESTORATION

- A. As specified in Section 31 22 01 – FIELD GRADING.

4.05 TRENCH EXCAVATION

- A. Preserve material below and beyond the lines of excavations.
- B. Locate stockpiled excavated material at least three feet (90 cm) from edge of excavations and prevent cave-ins or bank slides.

- C. Remove rock to the greater of six inches (150 mm) or as required by Plan Notes, seal if required, and backfill with bedding material.
- D. Refer to Section 31 22 01 – FIELD GRADING, for additional requirements.

4.06 UNAUTHORIZED EXCAVATION

- A. CONTRACTOR is responsible for backfilling unauthorized excavations.
- B. Unauthorized excavations which extend to and expose rock will be sealed with at least six inches of CLSM, concrete, or sprayed with bitumen within eight hours of exposure. If sealing is delayed more than eight hours, over excavate at least six inches below the excavation bottom to expose fresh rock and seal within eight hours.
- C. Remaining extent of unauthorized excavation will be filled with bedding material.

4.07 BACKFILL

- A. Contractor responsible for obtaining all inspections and approvals.
- B. All trenches and excavations shall be backfilled as soon as practicable after the pipe has been installed unless other protection of the pipe is directed or shown on the plans.
- C. The backfill around the pipe up to the top of the pipe shall be placed in loose layers not exceeding six inches per layer and thoroughly compacted by hand or power tampers approved by the OWNER. Great care shall be used to obtain thorough compaction under the haunches and along the sides of the pipe. Over the top of the pipe, backfill layers of approximately eight inch depth shall be added with each layer compacted separately and thoroughly until the trench is completely and uniformly filled to a depth of two feet above the top of the pipe. Backfilling operations shall be done in such a manner as to avoid movement or damage to the pipe.
- D. Backfill material shall be brought up evenly by depositing the material in layers approximately nine inches in loose depth and without injuring the pipe by shock, jar or excessive free fall. Each layer shall be thoroughly compacted by power tampers operated with care so as not to injure the underlying pipe or appurtenances. Hand tampers may be used in corners or narrow places inaccessible to power tampers. If compaction is done using hydraulically-operated backhoe-mounted compactors with minimum rated impulse force of 6,400 pounds with a minimum of 2,000 cycles per minute, the backfill material may be deposited in layers not more than two feet in loose depth. Layers in excess of two feet may be deposited only if tests, conducted at the CONTRACTOR's expense, show, to the satisfaction of the OWNER, that the specified degree of compaction is being achieved. There shall be at least three feet of compacted backfill over the pipe before this method of compaction may be employed.
- E. Backfilling shall be kept completed up to a point within 100 feet of the end of the newly laid pipe unless otherwise directed by the OWNER. During backfilling operations, no sheeting or bracing shall be removed without permission of the OWNER.
- F. Fill to lines and grades necessary to provide finish grades.
- G. Use a placement method that does not disturb or damage other work or existing features.
- H. Maintain fill materials within two percent of optimum moisture, to attain required compaction density.

- I. Place and compact material in equal continuous layers.
- J. Maximum compacted depth is six inches for aggregate materials and eight inches for soil materials, unless noted otherwise.

4.08 COMPACTION

- A. As specified in Section 31 22 01 – FIELD GRADING.

4.09 UTILITY IDENTIFICATION

- A. Install marking tape over all site utilities, 12 inches below finish grade or as indicated on Contract Drawings.
- B. Install trace wire at top center of marking tape; pull wire taut to remove slack.
- C. Extend trace wire to utility boxes, manholes and junctions to allow for connection to subsurface location equipment.

4.10 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

- A. General
 - 1. The OWNER shall perform field quality control tests separate from acceptance testing. CONTRACTOR test results will not be used by the OWNER for acceptance.
 - 2. The Owner will perform field density testing for quality assurance testing in accordance with ASTM D1556, ASTM D2167, or ASTM D6938. Acceptance of compaction will be in accordance with City's test only.
 - 3. Compaction shall be deemed to comply with the specifications when no more than one test of any three consecutive tests performed by the City falls below the specified relative compaction. The one test shall be no more than three percentage points below the specified compaction. The CONTRACTOR shall pay the costs for any retesting or additional testing of work not conforming to these Specifications.
 - 4. Where compaction tests indicate a failure to meet the specified compaction, the City will take additional tests in each direction until the extent of the failing area is identified. Rework the entire failed area until the specified compaction has been achieved.

B. Compaction:

1. Material shall be placed and compacted in layers until the density is not less than the percentage of maximum dry density indicated in Table 31 23 33-1 determined by ASTM D698 or other approved method.

Table 31 23 33-1	
Max Lab Dry Wt. (lbs/ft ³)	Min Compaction Requirements (% Lab. Max.)
90 to 104.9	100
105 to 119.9	98
120 and more	95

2. The Engineer will evaluate field density test results in relation to maximum dry density as determined by testing material in accordance with ASTM D698 (Standard Proctor).
3. Location of field density tests shall be determined by the OWNER.
4. Minimum frequency of City field density tests as specified in Table 31 23 33-2.

Table 31 23 33-2	
Area	Frequency
Trench (Structural Areas)	1 per lift for every 1,000 linear feet (300 m) of trench
Trench (Non-Structural Areas)	1 per alternate lift for every 1,000 linear feet (300 m) of trench

5. Regardless of the minimum testing frequency specified, field density tests shall be performed by the CONTRACTOR in sufficient number for the CONTRACTOR's quality control purposes to ensure that specified density is obtained.

4.11 ADJUSTING

A. Shrinkage:

1. Backfill to a height above finished grade which will allow for the shrinkage or consolidation of material. Initially, provide at all points, an excess of at least one percent of total height of backfill measured from stripped surface to top of finished surface.

2. Supply specified materials and build up low places, without additional cost if embankment or backfilling settles to be below the indicated level for proposed finished surface at any time before final acceptance of the work.

4.12 PROTECTION

- A. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines and embankments or existing structures and pipelines.

END OF SECTION 31 2 3 33

SECTION 32 13 10 - CONCRETE SITE WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section consists of furnishing all materials, forms, transportation and equipment, and performing all necessary labor to do all the plain and reinforced concrete work shown on the Drawings, or incidental to the proper execution of the work, or as herein specified.
- B. Concrete shall be composed of cement, fine aggregate, coarse aggregate, and water, so proportioned and mixed as to produce a plastic workable mixture in accordance with all requirements under this section suitable to the specific conditions of placement.

1.02 RELATED SECTIONS

- A. 32 13 13 Concrete Paving

1.03 SUBMITTALS

- A. All materials specified shall be certified by the producer or manufacturer that the furnished material meets the specific requirements of the specifications.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cement:
 - 1. Cement for all concrete shall be domestic Portland cement that conforms to the requirements of ASTM Designation C 150, Type I, Type II or Type III. Type III cement for high early strength concrete shall be used only for special locations and only with the approval of the Engineer. Type II cement shall be used in the construction of sanitary sewer manholes, wet wells, and pump stations.
 - 2. Only one brand of cement shall be used in any individual structure unless approved by the Engineer. Cement which has become damaged, partially set, lumpy or caked shall not be used and the entire contents of the sack or container which contains such cement will be rejected. No salvaged or reclaimed cement shall be used.
- B. Fine Aggregate: Fine aggregate shall conform to the requirements of Section 902, Article 902-1 of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction", latest edition.
- C. Coarse Aggregate: Coarse aggregate shall conform to the requirements of Section 901 of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction", latest edition, except that slag shall not be used and the gradation shall be grade 57 as approved by the Engineer.

- D. Water: Water shall be taken from a potable water supply and shall be fresh, clean, and free from injurious amounts of oil, acid, alkali, or organic matter.
- E. Admixtures: No admixtures shall be used except by specific approval of the Engineer. When approved, admixtures shall meet the following minimum standards.
 - 1. Air entraining agent: ASTM C 260.
 - 2. Water Reducing and Retarding Admixture: ASTM C 94, Type D and free of chlorides.
- F. Membrane Curing Compound: Membrane curing compound shall conform to the requirements of AASHTO Designation M 148, Type 1-clear, or Type 2-white pigmented.
- G. Expansion Joint Filler:
 - 1. Preformed expansion joint filler shall be of the non-extruding and resilient bituminous type and conform to the requirements of AASHTO Designation M 213.
 - 2. Expansion joint filler shall be gray neoprene sponge rubber that conforms to AASHTO Designation M 153, Type I.
- H. Separation Board: Separation board shall be closed cell, non-extruding, PVC foam Grade #327 as manufactured by AC Horn, Inc., with a 20-psi maximum compressive strength to compress to 75% of thickness.
- I. Membrane: Membrane shall be a 6-mil polyethylene film.
- J. Reinforcing Steel:
 - 1. Reinforcing steel shall conform to the requirements of ASTM Designation A 615, Deformed Grade 60, except where otherwise indicated.
 - a. The name of the manufacturer of the reinforcing steel shall be called out in the shop drawings together with a sketch showing the pattern of the deformation, including the mill mark.
 - b. Bar reinforcement shall be accurately fabricated in accordance with the latest CRSI Manual of Standard Practice. The Contractor shall have prepared and shall submit to the Engineer in sextuplicate, necessary shop drawings and bar lists. The Contractor shall be responsible for errors made in shop drawings even though approved by the Engineer.
 - 2. Welded wire fabric for concrete reinforcement shall conform to the requirements of ASTM Designation A 185 and shall be formed with smooth cold-drawn wire.
 - 3. Cold-drawn wire for spirals shall be plain and shall conform to the requirements of ASTM Designation A 82 with a minimum yield strength of 70,000 psi.
 - 4. Bar Supports:
 - a. Bar supports for reinforcing steel shall conform to the requirements of CRSI Manual of Standard Practice, Chapter 3 and shall be of a height to furnish the concrete cover called for on Drawings. High chairs shall be furnished for bent or top bars in solid slabs. Bar supports to be in contact with exterior surfaces of concrete shall be Class C with plastic caps at least 1-inch in length on the leg tips, or Class E with stainless steel legs. Bar supports shall be spaced not more than 100 times the diameter of the bars to be supported, with not more than 1/4 spacing from the end of the supported bars to the first chair.
 - b. Bar supports for slabs on grade shall be plain concrete blocks, 3-inches high by 4-inches square with tie wires embedded in support. Concrete strength shall be at 3,000 psi at time of use.

- K. Forms: Forms shall be of wood, steel, or other approved materials. The sheeting for all exposed surfaces shall be 5-ply plywood, unless otherwise specifically authorized. Forms of like character shall be used for similarly exposed surfaces in order to produce a uniform appearance. Forming for exposed exterior concrete from 1-foot below finished exterior grade to top of structure shall be carefully fabricated so as to provide a smooth finish without defects. The type, size, shape, quality, and strength of all materials of which the forms are made shall be subject to the approval of the Engineer. If it is his opinion that the interior surfaces of the forms are too irregular to produce the specified finish, they shall be lined with smooth, dense, moisture resistant hardboard or other material of which he approves.
- L. Non-shrink Grout: Non-shrink grout shall be nonmetallic, pre-mixed type and shall be Sauereisen F-100 Level Fill, Master Builders Masterflow 713, Burke Non-Ferrous, Non-Shrink Grout or approved equal.

2.02 CLASSIFICATION AND STRENGTH OF CONCRETE

- A. Class and minimum strength requirements for concrete shall be as tabulated below. Unless otherwise specified, Class B concrete shall be used.
- B. Strength Requirements: Concrete class and strength shall meet the minimum compressive strength requirements at the age of 7 and 28 days as shown in the following table. The compressive strengths shall be as determined by standard laboratory cylinder tests in accordance with the procedure set forth in ASTM Designation C 31 and C 39.
1. Compressive Strength in Pounds Per Square Inch

		For Design 3 Consecutive Cylinder Avg.		Low Cylinder	
Class	Strength	7 Days	28 Days	7 Days	28 Days
A	4000	2950	4250	2600	3750
B	3000	2100	3200	1850	2800
C	2500	1800	2700	1550	2300

PART 3 EXECUTION

3.01 PREPARATION

- A. Concrete Mixing:
1. The concrete shall be ready-mixed, and the equipment shall conform to the applicable requirements of ASTM Designation C 94.
 2. Equipment necessary to positively determine and control the actual amounts of all materials entering the concrete shall be provided by the Contractor or the concrete manufacturer. All materials shall be measured by weight, except that water may be measured by volume. A bag of cement weighs 94 pounds.

3.02 INSTALLATION

- A. Forms shall be built true to line and grade and shall be mortartight and sufficiently rigid to prevent displacement or sagging between supports. Particular attention shall be given to adequacy of supports and shoring, which is the Contractor's responsibility. The surfaces of forms used for permanently exposed surfaces shall be smooth and free from irregularities, dents, sags, or holes. Forms for surfaces to receive stucco finish shall be suitable for its application. Bolts and rods used for internal ties shall be so arranged that, when the forms are removed, all metal is at least 1 1/2-inch from any concrete surface. Form ties shall be removed immediately after removal of forms, and holes shall be thoroughly plugged with grout within 24 hours after form removal and kept damp for 4 days to prevent shrinking.
- B. Wire ties will not be permitted. All forms shall be so constructed that they can be removed without hammering or prying against the concrete. Unless otherwise indicated, suitable moldings shall be placed to bevel or round exposed edges at expansion joints or at any other corners that are to remain. Beams below grade shall have forms at both sides.
- C. Coating: Prior to the placing of steel reinforcement or concrete, forms for exposed surfaces shall be coated with a nonstaining paraffin base oil or mineral oil. Forms for unexposed surfaces may be thoroughly wetted in lieu of oiling, immediately before the placing of concrete.
- D. Removal: Forms and/or form supports shall not be removed from any concrete until it has obtained sufficient strength to support itself and any live loads it may be subjected to, and then only with the approval of the Engineer.
- E. Reinforcing Steel: When placed in the forms, reinforcement shall be clean and free of all rust, scale, dust, dirt, paint, oil or other foreign material and shall be accurately and securely positioned in the forms as shown on the Drawings before the placing of concrete. Reinforcing steel shall be wired or otherwise fastened together at intersections and shall be supported by concrete or metal supports, spacers, or hangers. Bar supports, where adjacent to the ground, shall be set on precast concrete pads compressed into the subgrade. The Contractor shall obtain the Engineer's approval before fastening reinforcing steel at intersections by welding methods.
 - 1. Splicing of reinforcement shall be placed at points of minimum stress. Bars shall be lapped at splices a minimum of 24 bar diameters unless otherwise shown on the Drawings or directed by the Engineer and shall be rigidly wired or clamped.
 - 2. Wire fabric shall be straightened before placing and shall overlap one full space of mesh at ends and edges and shall be securely fastened. Fabric shall be supported so as to occupy its proper location in the concrete as shown on the Drawings. Fabric shall not cross any expansion joints.
- F. Embedded Items: In addition to steel reinforcement, pipes, inserts and other metal objects as shown, specified, or ordered shall be built into, set in, or attached to the concrete. All necessary precautions shall be taken to prevent these objects from being displaced, broken, or deformed. Before concrete is placed, care shall be taken to determine that all embedded parts are firmly and securely fastened in place as indicated. They shall be thoroughly clean and free from paint or other coating, rust, scale, oil, or any foreign matter. No wood shall be embedded in concrete. The concrete shall be packed tightly around pipes and other metal work to prevent leakage and to secure perfect adhesion. Drains shall be adequately protected from intrusion of concrete.
- G. Separation Board: Two-inch separation board shall be installed as indicated on the Drawings.
- H. Concrete:

1. General: Reinforcement shall be secured in position, inspected, and approved before placing concrete. Runways for transporting concrete shall not rest on reinforcing steel. Concrete not placed within 90 minutes from the time mixing is started will be rejected and shall be removed from the job by the Contractor. Concrete shall not be allowed to drop freely more than six feet. All concrete shall be placed in daylight and (excepting seal concrete) shall be placed in the dry unless otherwise authorized by the Engineer in writing.
2. Slabs Placed on Subgrade: Slab concrete placed on earth or fill subgrade shall be separated from direct contact with the subgrade by 6 mil polyethylene film or other approved material. Sidewalks and walkways will not require a separation sheet. Polyethylene film shall be lapped 4-inches on sides and 12-inches on ends.
3. Compaction: Concrete shall be compacted by internal vibrating equipment, supplemented by hand rodding, and tamping as required. Vibrators shall in no case be used to move the concrete laterally inside the forms. Internal vibrators shall maintain a speed of at least 5000 impulses per minute when submerged in concrete. (At least one spare vibrator in working condition shall be maintained at the site during concrete placing operations.) duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing segregation. Vibrator shall be moved constantly and placed in each specific spot only once.
4. Bonding: Before depositing new concrete on or against concrete that has set, the surfaces of the set concrete shall be thoroughly cleaned so as to expose the coarse aggregate and be free of laitance, coatings, foreign matter and loose particles. Forms shall be retightened. The cleaned surfaces shall be dampened, but not saturated, and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. The grout shall be as thick as possible on vertical surfaces and at least 1/2-inch thick on horizontal surfaces. The fresh concrete shall be placed before the grout has attained its initial set.
5. Protection: Rainwater shall not be allowed to increase the ratio of mixing water nor to damage the surface finish. Concrete shall be protected from disfigurement, damage, vibration, internal fractures, and construction overloads.

I. Curing:

1. All concrete, including gunite, shall be water cured by covering with a double thickness of clean burlap, cotton mats, or other approved material kept thoroughly saturated with water. The forms shall be kept wet until removed and upon removal, the curing specified herein shall be started immediately. Concrete shall be cured for a period of 7 days for normal Portland cement.

- J. Grout for pointing and patching shall consist of cement and fine aggregate mixed in the proportions used in the concrete and a minimum amount of water to produce a workable grout. Material for grouting column base plates, anchor bolts, reinforcing bars, pipe sleeves and pump base plates shall be of the non-shrink type and shall be mixed and placed as recommended by the manufacturer. Machinery set on grout pads shall not be operated until the grout has cured for at least 24 hours.

3.03 FIELD QUALITY CONTROL

- A. The quality of the concrete as to conformance to the specifications is the entire responsibility of the Contractor until it is accepted in place in the structure and verified by the final cylinder tests made by the laboratory. Arrangements for field testing shall be made by the Contractor with the laboratory as selected by the Owner.

- B. Standard laboratory compressive test cylinders will be obtained by the laboratory when concrete is discharged from the mixer at the site of the work. A set of 6 cylinders will be obtained for each 60 cubic yards or fraction thereof placed each day, for each type of concrete. The cylinders will be cured under laboratory conditions and will be tested in two groups of three at 7 and 28 days of age, respectively.
- C. The laboratory of the Owner or their representative will make slump tests of Class A and Class B concrete as it is discharged from the mixer at the site of the work. Slump tests will be made for each 25 cubic yards or "pour" of concrete placed. Slump tests may be made on any batch and failure to meet specified slump requirements will be sufficient cause for rejection of that batch.
- D. Proper reports of all tests performed by the laboratory will be prepared by the laboratory and submitted promptly to the Engineer. Such reports shall be properly labeled so as to identify the portions of the project into which the materials have been placed.

3.04 PRECAST CONCRETE STRUCTURES

- A. Precast structures shall be constructed in accordance with Section 400, Concrete Structures of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

END OF SECTION 32 13 10

SECTION 32 13 13 - CONCRETE PAVING

PART 1 GENERAL

1.01 DESCRIPTION

- A. All site related poured-in-place concrete including but not necessarily limited to concrete curbs, thrust blocks, storm structures, sanitary structures, etc.
- B. Reinforcing Steel and Accessories.
- C. Form Work.
- D. Setting of all anchors, bolts, and sleeves.
- E. Related Work Specified Elsewhere:
 - 1. Excavation: Section 31 23 16.
 - 2. Asphaltic Concrete Paving: Section 32 12 16
 - 3. Concrete (Site Work): Section 32 13 10

1.02 QUALITY ASSURANCE

- A. The American Concrete Institute Field Reference Manual, Publication SP-15, "Specifications for Structural Concrete for Buildings, ACI 301, with selected ACI and ASTM references," and ACT Standard 318-77, "Building Code Requirements for Reinforced Concrete" are hereby included in and made a part of these specifications. A copy of these manuals shall be kept in the project field office at all times and made available to all personnel involved in supervising, inspecting, or testing of concrete work.
- B. Supervisory personnel responsible for execution of concrete work shall make themselves thoroughly familiar with all requirements of the ACI field manuals and these specifications and shall enforce all applicable regulations therein.

1.03 SUBMITTALS

- A. Submit sufficient shop drawings for reinforcing steel, form work and concrete mixes to Engineer for approval. Obtain approval of drawings prior to fabrication of any material or proceeding with the work. Shop drawings for reinforcing steel shall indicate bending diagrams; assembly diagrams, splicing and laps of bars, shapes, dimensions, and details on bar reinforcing and accessories. Drawings shall be prepared in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACT-315. Scale dimensions from structural drawing shall not be used in determining the lengths of reinforcing rods. Complete placement plans and details shall be included.
- B. The Contractor is responsible for all dimensions of the concrete work and shall check the structural drawings in relation to all other drawings and shall verify all dimensions in relation with other work at field conditions. Contractor is responsible for proper arrangement and fit of the work and if discrepancies are noted between the various drawings and work, the contractor shall notify the Engineer immediately in writing and shall not proceed until so directed.

- C. The omission from shop drawings of any material shown on the original structural drawings or called for by these specifications shall not relieve the Contractor of the responsibility for furnishing and installing such materials, even though such shop drawings may have been returned as approved.

1.04 SUBMITTALS

- A. Submit in accordance with Division 1 requirements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type 1. If recommended by the manufacturer of the integral concrete color admixture, use White Portland Cement.
- B. Sand: Clean, hard, and natural sand, or manufactured sand, or a combination of both and conforming to ASTM C33. A sand with fineness modules not less than 2.1 nor more than 250 PPM Tannic Acid shall be used.
- C. Coarse aggregate shall be hard, durable, uncoated crushed stone or gravel conforming to ASTM C-33 and shall be nonreactive. Maximum size of aggregate shall not exceed 1/5 the narrowest dimension between side forms not 3/4 the minimum spacing between individual reinforcing bars.
- D. Water: Clean, fresh, potable, free from injurious amounts of vegetable matter, alkalies and other impurities.
- E. Water Reducing Admixture: Conforming to ASTM C494, Type A or D such as WRDA, Pozzololith.
- F. Air Entraining Admixture: Conforming to ASTM C260, such as Darex or M.B.V.R
- G. Reinforcement:
 - 1. Reinforcing Bars: Bars shall be deformed billet steel conforming to ASTM A615, Grade 60 as called for on the drawings. Reinforcement shall be clean and free from loose rust, scale or other coatings that will reduce bond
 - a. In all corners provide and install pre-bent reinforcing corner bars of same grade and size of connecting reinforcing steel. Laps shall meet all codes and institute recommendations but in no case will the lap be less than 40 diameters.
 - 2. Welded Wire Fabric Reinforcing: (ASTM A185) Steel wire spot welded at intersections and of size indicated. Where size is not noted, it shall be 6" X 6" mesh, No. 10 gauge. Use wire reinforcing in all slabs on grade, including sidewalks, and elsewhere indicated.
- H. Metal Accessories: Include all spacers, chairs, holsters, ties, and other devices necessary for properly placing, spacing, supporting, and fastening reinforcing in place. Metal accessories shall have plastic tips where legs will be exposed in finishes concrete surfaces. Accessories shall conform to requirements of the Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice". In foundations chairs and other accessories fabricated from concrete, ceramic or plastic may be used in place of metal accessories with approval by the Engineer.

- I. Crack Control Joints: Saw cut control joints and filled with grout. Cuts to be 1/8" wide and 1/5th the depth of the slab.
- J. Expansion Joint Filler: Asphalt impregnated fiberboard conforming to ASTM D-1751 and extending full depth of slab or joint.
- K. Curing Compounds: Thompson's Clearbond or Lambert #64 water seal curing compounds, (non-staining type). Curing agent to be equal to Davis W-1000 Clear or as approved by the manufacturer of the integral concrete color admixture.
- L. Integrally colored concrete: equal to Davis Colors in Mix-Ready disintegrating bags. Colors to comply with ASTM C979 Pigments for Integrally Colored Concrete. All work to be in strict compliance with manufacturer's latest directions.

2.02 MIXES

- A. All concrete, unless otherwise specified, shall be controlled concrete and shall be proportioned as outlined in Section 4.4 of the Building Code of the American Concrete Institute (ACI-318) except as otherwise required by these specifications. The allowable design stresses are based upon the minimum 28-day compressive strength of 3000 psi. Minimum slump is 5", plus or minus 1".
- B. All concrete mixtures shall be designed by an independent laboratory approved by the Engineer and paid for by the Contractor.
- C. Proportions:
 - 1. Proportions of materials shall be selected to provide a plastic, workable mix.
 - 2. Water shall be accurately, uniformly measured into mix by water measuring device. Aggregates shall be periodically tested for water content and added mixing water adjusted accordingly, without changing the water-cement ratio established for the job.
 - 3. All measurement of materials shall be done by weight with allowance made for moisture content of aggregates. Admixtures shall be dispensed by automatic, metered devices with at least plus or minus 5% accuracy. These dispensers shall be regularly inspected and certified as to accuracy by the manufacturer of the admixture.
 - 4. Concrete supplier shall submit to the Engineer (through the General Contractor) for approval, complete design data, mix quantities, properties of aggregates and laboratory strength test reports for each proposed concrete mix. Mix and all tests shall have been made by an independent testing laboratory. Any changes in mix required by the Engineer shall be made at no additional cost to the Owner.
- D. Admixtures
 - 1. Use Type "A" (normal) admixture for all structural concrete except when air temperature exceeds 85 F, use Type "D" (retarder) admixture.
 - 2. Type "E" (accelerator) admixture shall be used only when air temperature drops below 50 but shall not be used in prestressed concrete or concrete containing embedded items of aluminum or galvanized steel.

PART 3 EXECUTION

3.01 FORMS

- A. All forms shall conform to the lines, dimensions and shapes of the concrete as indicated on the drawings. They shall be water-tight to prevent leakage of mortar and shall be smooth except where otherwise required, and free from defects where the concrete is to be left exposed. The forms shall be in such condition and have ample supports so that they will not bulge or get out of line or level as concrete is placed. For exposed work, the maximum tolerance in line and level will be 1/16" at the joints. It will be the Concrete Contractor's responsibility to see that forms are supported well enough to ensure the safety of workmen and the public, regardless of any review by Engineer. Design of form work shall comply with ACI 347.
- B. The inside surface of wood board forms shall be soaked with clean water prior to placing concrete. Plywood shall be treated with an approved form oil or lacquer. If oil is used, all excess oil shall be wiped off with rags to leave the surface of the forms just oily to the touch. Where plaster bond finish is required, forms shall not be oiled. Forms shall not be oiled after reinforcing is in place. Form oil on reinforcing will not be permitted.
- C. All keys shall be securely held in position by continuous wood blocking rigidly secured to forms of reinforcing.
- D. Re-usable forms shall be maintained properly by cleaning and repairing after each use as required to insure satisfactory finished concrete work.

3.02 PREPARATION

- A. General: Except as otherwise specified, concrete shall be ready mixed or job mixed at the Contractor's option, in an approved type of power operated mixer that will insure a uniform distribution of the material throughout the mass, and in accordance with the requirements of the American Concrete Institute Building Code 318-77 and 304-73.
- B. Ready-Mix Concrete: Ready mixed concrete shall be mixed and delivered to the project in accordance with ASTM Specification C-94.
- C. No water shall be added to mixer after leaving ready mix plant without specific approval from Engineer, Engineer, or Inspector.
- D. Before placing concrete, all debris, water shall be removed from the places to be occupied by the concrete. Wood forms shall be thoroughly wetted or oiled, and the reinforcement cleaned. Formwork and the placement or reinforcement, pipes, sleeves, conduit, hangers, anchors, and other inserts shall be inspected and approved by the Engineer and the Building Department before any concrete is deposited.
- E. Screeds: All screeds shall be set with a level and not by measuring above preset forms. Check architectural drawings for areas to be recessed. All slabs to be drained shall slope to floor drains and set a minimum of one (1) inch below finish grade. Full slab thickness shall be maintained. Set screeds at center of span of structural slabs and beams to provide camber to offset anticipated dead load deflection.

3.03 INSTALLATION

- A. Placing of reinforcement shall comply with the Concrete Reinforcing Steel Institute's Manual for Recommended Practice for Placing Reinforcing Bars, 2nd Edition, ACI Manual 301-73 and ACI Code Requirements 318-77.
- B. Place reinforcement accurately in position shown, securely fasten and support to prevent displacement before or during pouring. Bending, placing, and splicing of reinforcement shall be in accordance with approved shop drawings. Mesh reinforcement in slabs shall have sides and ends lapped not less than one mesh.
- C. Provide for installation of inserts, sleeves, anchors bolts, stair nosings, dowels, nailing strips, blocking grounds and other fastening devices required for attachment of other work. Properly locate in cooperation with other trades and secure in position before concrete is poured.
- D. All sleeves, chases, inserts, hangers, etc., which are provided and placed in the forms by the various trades, shall be maintained in position and protected until the concreting is completed.
- E. Concrete shall be rapidly handled from mixer to forms and deposited as nearly as possible in its final position to avoid segregation due to rehandling or flowing. Placement of concrete shall follow ACI 301-73 and ACI 304-73 recommendations.
- F. Truck mixing shall be delayed until only time remains to accomplish mixing before placing. During extremely hot weather, avoid unnecessary exposure of mixers to sun while waiting. Dispatching o trucks and organization of use of concrete shall be coordinated to avoid unnecessary mixing of concrete. Provide sufficient personnel to handle work properly to avoid temptation to add water for handling. Maximum time from introduction of mixing water to discharge shall not exceed 90 minutes; reject all concrete in truck over 90 minutes.
- G. No concrete that has partially hardened or been contaminated by foreign material shall be deposited in the work
- H. All concrete shall be placed upon clean, damp surfaces, free form water.
- I. Concrete shall not be allowed to drop freely more than three (3) feet. Where greater drops are required, a tremie or other method approved by the Engineer shall be employed.
- J. Concrete shall be mixed and placed only when the temperature is at least 40o F. and rising. Refer to ACI 305-72 and ACI 306-66, respectively, for additional recommendations for hot and cold weather concreting.

3.04 FIELD QUALITY CONTROL

- A. All testing will be approved by the Owner and Engineer and paid for by the General Contractor. Testing laboratory shall be notified by the Contractor when concrete is being placed and field testing and test cylinders are being obtained. There shall be not less than one test for each concreting event or less than one test per 25 cubic yards of poured concrete.

- B. The Contractor shall designate one of his personnel to make all test cylinders, slump, and air entrainment tests, and take all other samples required at the site. This person must make himself familiar with the proper procedures and techniques necessary and shall demonstrate to the Engineer's office sufficient and proper knowledge of the task. He shall be available at all times when concrete is being placed and shall take samples and make tests as specified. He shall properly mark and identify each test cylinder, store and protect same until they can be delivered to the testing laboratory, and keep an adequate log record of all cylinders and other tests made, including areas or locations where concrete was placed for which test or samples were taken.
 - 1. Concrete supplier shall agree in writing in advance that they accept the test cylinders made by this designated person or the General Contractor may employ the concrete supplier to make the cylinders, slump the concrete and make air entrained test.
- C. Compression and Strength Tests: Each test shall consist of four standard 6" x 12" cylinders; one cylinder to be tested at the age of seven (7) days and two (2) cylinders at the age of twenty-eight (28) days. The fourth cylinder shall be retained for further testing, if necessary. Samples from which compression test specimens are molded shall be secured in accordance with ASTM C172. Strength tests shall be made in accordance with ASTM C39.
- D. Slump Tests: Tests for slump shall be made at the place of deposit and in accordance with ASTM C143. Tests shall be made on each truckload of concrete delivered before any concrete is discharged into the forms. Concrete with slump over 5 inches shall be rejected and not placed. Water may be added at the rate of one gallon per yard to increase the slump by approximately one (1) inch to improve workability. Engineer's or Inspector's approval is required.
- E. Enforcement of Strength Requirements:
 - 1. Acceptability of concrete shall be in accordance with ACI 318-77. When the ultimate compressive strength of any cylinder falls below the specified strength for the class of concrete specified, the design mix and water content shall be adjusted to produce the specified strength for concrete that is subsequently placed. In addition, the Engineer may order additional curing for the portion of the structure where questionable concrete has been placed. In the event that such additional curing does not give the strength required, as determined by load tests made in accordance with ACI 318-77, or cored cylinder tests, and if such tests indicate the necessity, the defective parts shall be removed and replaced or shall be reinforced as directed by the Engineer, at the Contractor's expense, including the expense of the tests, engineering and architectural fees.
 - 2. Four (4) copies of laboratory test reports shall be sent directly to the Engineer, and two (2) to the General Contractor by the laboratory.

3.05 FINISHES OTHER THAN FOR SLABS

- A. All exposed concrete surfaces except as otherwise specified or called for in the Finish Schedule shall, after removal of forms, have all fins and form marks removed by grinding. All exposed interior and exterior formed concrete shall have Class 1 Surface Finish I strict accordance with the requirements of Section 400-15 FDOT Standard Specification for Road and Bridge Construction.

- B. Patching: Any concrete which is not formed as shown on the drawings or for any reason is not of alignment or levels or shows a defective surface shall be considered as not conforming with the intent of these specifications and shall be removed from the job by the Contractor at his expense unless the Engineer grants permission to patch the defective area. Permission to patch any such area shall not be considered a waiver of the Engineer's right to require complete removal of the defective work if the patching does not, in his opinion, satisfactorily restore the quality and appearance of the surface.

3.06 SLAB FINISHES

- A. General:
1. The finish of slabs shall be as indicated on the drawings or as herein stipulated or as is obviously suitable for the specific floor or slab. Hereinafter listed are descriptions of common types of finish. Finished concrete slabs shall be worked so that aggregate will not be visible in the top surface.
 2. All slabs to be protected during construction to prevent marring and defacement.
 3. Where the allowable tolerances in surface elevation of slabs are exceeded, the Engineer may direct the contractor to grind or patch the floor to bring the surface within the requirements. Grinding shall be done as soon as possible but not before three (3) days of cure.
- B. Finishes:
1. Broom: Sidewalk slabs in other locations so specified, shall be given a coarse transverse scored texture by drawing a broom across the surface. This operation shall follow immediately after floating.
 2. Interior: Smooth trowel finish.

3.07 CURING AND PROTECTION

- A. Curing:
1. The top surface of all slabs shall be sprayed with an approved liquid membrane-forming compound in accordance with the directions of the manufacturer as soon as the newly placed surface has been finished and will not be marred by application.
 2. The liquid membrane-forming compound shall meet the requirements of "Specifications for Liquid Membrane-Forming Compounds for Curing Concrete" (ASTM C-309).
 3. Surfaces subject to heavy rainfall within three (3) hours of compound application shall be resprayed.
 4. Where practicable, forms shall be kept in place for a 7-day curing period. The top exposed concrete surface shall be kept wet and the wood forms shall be kept moist. In order that the curing water may reach the surfaces of walls, beams and columns, the forms shall be loosened to allow the water to be poured over the top and thus run down between the concrete and the forms.
 5. If not practicable to keep forms on for seven (7) days, cover concrete with fabrics which have moisture retaining properties. Such materials shall be examined carefully to detect elements that might discolor the finish. Such covers also shall be kept continuously moist to insure a film of water on the surface.
- B. Protection:
1. Protect concrete from construction traffic, including action of sun, rain, flowing water, frost, or mechanical injury for a period of two (2) weeks after placing.

3.08 TOLERANCES

A. Variation in surface tolerance:

1. 1/8" per 10' in any direction. Deflection of form facing material between supports shall not exceed $0.0025 \times \text{span}$.

END OF SECTION 32 13 13

SECTION 32 18 00 - BULLPEN MOUND MATERIAL

PART 1 – GENERAL

1.01 1.01 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Infield skinned area surfacing for the baseball fields as shown on the Drawings and as specified herein.
 2. Warning track surface for the baseball fields as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- a. The following Related Work to be performed under the designated Sections:
2. Section 31 22 01 – FIELD GRADING

1.03 SUBMITTALS AND SAMPLES

- a. Product Data: Submit manufacturer's current catalogue cuts and specifications and
.....supplier's material
certificates for the following:
2. Submit a physical sample along with a private, third-party lab test results indicating particle size analysis of the material specified. All tests shall be performed in accordance with ASTM F1632-03 - Particle Size Analysis and Sand Shape Grading of Golf Course Putting Green and Sports Field Rootzone Mixes

1.04 QUALIFICATIONS / SPECIAL REQUIREMENTS

- a. The infield surface materials shall be one manufacturer's materials only and one system from that manufacturer.
- b. The Contractor shall have at least 5 years' experience installing infield surface materials of this type.

1.05 PROJECT / SITE CONDITIONS

- a. Infield surfacing shall be installed in dry to moderately moist weather conditions or as otherwise specified by the manufacturer. Infield surfacing shall not be installed when the ground is wet, soggy or frozen.

PART 2 – MATERIALS

6.01 2.01 BULLPEN MOUND MATERIAL

- a. Mound material shall be a clean, dry clay mixed with washed mason-type sand resulting in weed-free mix reddish in color and meeting the following mechanical analysis:
 - 1) Sand: 15%

- 2) Clay: >75% (0.05mm-0.002mm)
- 3) Silt Clay Ratio (SCR): 0.75-1.25
- b. Recommended products or approved equal:
 - 1) DuraPitch BlackStick Mound Clay
 - 2) Owner approved equal

PART 3 – EXECUTION

7.01 3.01 INFIELd SURFACING

- A. Infield surfacing shall be installed in strict conformance with the manufacturer's specifications to the lines and grades as shown on the Drawings. Materials are to be installed in 2 lift and compacted with a 1-ton vibratory roller until compaction is between 90-95%. Scarify the surface prior to conducting the next lift and repeat until mound is at finished grade.

3.02 TOLERANCES

- a. Verify finished elevation of the Infield Surfacing using laser equipment in the presence of the Architect/Engineer. Surface shall be +/- 0.02' of design elevation, with no more than 0.025' variance in any 25 linear feet.
- b. No depressions, humps or other surface irregularities will be permitted. Correct irregularities to the satisfaction of Owner.

3.05 TOP DRESSING

- a. After verification and successful inspection of site tolerances, top dress mound with ½" loose infield surfacing material. Coordinate with head groundskeeper for proper infield surfacing to utilize.

3.06 CLEAN UP

- a. Remove all remnant and unused materials from staging areas. Return any excess infield surfacing material to Owner for storage and future use.

END OF SECTION 32 18 00

SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, quality, product and performance requirements, general and supplemental conditions apply as applicable to the project and project documents.
 - 1. Chain-link fences.
 - 2. Swing gates.

1.02 SUMMARY

- A. This Section includes materials applicable for commercial/industrial and security chain link fence and gates.
 - 1. Polymer coated steel chain link fabric
 - 2. Polymer coated galvanized steel framework and fittings.
 - 3. Gates: Swing
 - 4. Installation

1.03 REFERENCES

- A. ASTM A491 Specifications for Aluminum-Coated Steel Chain-Link Fabric
- B. ASTM F567 Standard Practice for Installation of Chain Link Fence
- C. ASTM F668 Specification for Polymer Coated Chain Link Fence Fabric
- D. ASTM F900 Specification for Industrial and Commercial Swing Gates
- E. ASTM F934 Specification for Standard Colors for Polymer-Coated Chain Link
- F. CLFMI WLG2445, Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing

1.04 SUBMITTALS

- A. Shop Drawings: Site plan showing layout of fence location with dimensions and fence type, location of gates and opening size, cleared area, elevation of fence and gates, details of attachments and footings.
- B. Certifications: Manufacturers material certifications in compliance with current ASTM specifications.
- C. Domestic certifications: Material certifications, Made in U.S.A., Buy American Act or Buy America when required.
- D. Specification Changes: May not be made after the date of bid.

- E. Delegated-Design Submittal:
 - 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Company operating in the United States having U.S. manufacturing facility/facilities specializing in manufacturing chain link fence products with at least 5 years' experience.
- B. Fence contractor: Company with demonstrated successful experience installing similar projects and products in accordance with ASTM F567 and have at least 5 years' experience.
- C. Tolerances: Current published edition of ASTM specifications tolerances apply. ASTM specification tolerances supersede any conflicting tolerance.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver products to site per contract requirements.
- B. Storage: Store and protect products off the ground when required.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design chain-link fence and gate frameworks according to structural performance requirements.
- B. 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:
 - 1. Design Wind Load: Ultimate Design Wind Speed of 130 MPH.
 - a. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified.
 - 1) Full height padding to be assumed on all fencing.

2.02 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
 - 1. Fabric Height: 8 ft.
 - 2. Steel Wire for Fabric:
 - a. Wire diameter of 0.192 inch
 - b. Mesh Size: 2 inch
 - c. Polymer-Coated Fabric: ASTM F668, the wire gauge specified for polymer-coated wire is that of the metallic coated steel core wire.
 - 1) Class 2b fused and adhered over aluminum-coated steel wire.
 - 2) Color: Black, in compliance with ASTM F934.

3. Aluminum Wire Fabric: ASTM F 1183, with mill finish.
 - a. Wire diameter of 0.192 inch
 - b. Mesh Size: 2 inch
4. Selvage: Knuckled at both selvages, K&K.

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: 8' ft.
 2. Round steel pipe and rail: ASTM F1043 Group IA Table 3 Heavy Industrial Fence Framework, schedule 40 pipe. Regular Grade.
 - a. Line Post: 3.500 inches in diameter (minimum).
 - b. End, Corner, and Pull Posts: 3.500 inches in diameter (minimum).
 - c. Top, brace, bottom and intermediate rails, 1.660 inches OD, 2.27 lb/ft per ASTM F1043.
 3. Metallic Coating for Steel Framework:
 - a. Exterior zinc coating Type A, interior zinc coating Type A.
 4. Polymer coating over metallic coating.
 - a. Color: Match chain-link fabric, in compliance with ASTM F934.

2.04 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177-inch diameter, marcelled tension wire according to ASTM A817 or ASTM A824, with the following metallic coating:
 1. Type I: Aluminum Coated (aluminized)
- B. Polymer-Coated Steel Wire: 0.177-inch diameter, tension wire according to ASTM F1664, Class 2b over aluminum-coated steel wire. Wire gauge specified is the core wire gauge.
 1. Color: Match chain-link fabric, in compliance with ASTM F934.

2.05 SWING GATES

- A. General: ASTM F900 for gate posts and single swing gate types.
 1. Gate Leaf Width: As indicated in Drawings
 2. Framework Member Sizes and Strength: Based on gate fabric height as indicated in Drawings.
- B. Pipe and Tubing:
 1. Aluminum: ASTM B429/B429M; mill finish.
 2. Zinc-Coated Steel: ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework
 3. Gate Posts: Round tubular steel.
 4. 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. Closer: Manufacturer's standard.

2.06 FITTINGS

- A. Provide fittings according to ASTM F626.
- B. Finish:
 1. Aluminum: Mill Finish
 2. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
 - a. Polymer coating over metallic coating.

2.07 GROUT AND ANCHORING CEMENT

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

2.08 ACCESSORIES

- A. Fence padding as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

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 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, 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. Posts Set into Sleeves in Concrete: Use 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 non-shrink, nonmetallic grout or anchoring cement, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.
 - D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment as indicated on Drawings. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.
 - E. Line Posts: Space line posts uniformly as indicated on Drawings.
 - F. 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. As indicated on Drawings.
 - G. Chain-Link Fabric: Apply fabric to field playing side. Leave 2-inch (max) 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.
- 3.04 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.

END OF SECTION 32 31 13

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SECTION 32 92 05 - SYNTHETIC TURF PLAYING FIELD SYSTEM

PROJECT REQUIREMENTS AND CONDITIONS

PART 1 GENERAL

2.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.02 SUMMARY

- A. This Section includes the following:
 - 1. Synthetic turf playing field system requirements.
 - 2. Synthetic turf fabric and infill Manufacturer/Contractor's required qualifications for performing the work.
- B. Related Sections
 - 1. SEE SECTION 32 22 01 – FIELD GRADING
 - 2. SEE SECTION 32 92 10 – SYNTHETIC TURF PLAYING FIELD SYSTEM – SUBSURFACE DRAINAGE AND AGGREGATE BASE
 - 3. SEE SECTION 32 92 11 – SYNTHETIC TURF PLAYING FIELD SYSTEM

2.03 REFERENCES

- A. FM Factory Mutual
 - a. P7825 - Approval Guide; Factory Mutual Research Corporation; current edition
- B. ASTM – American Society for Testing and Materials.
 - a. D1577 - Standard Test Method for Linear Density of Textile Fiber
 - b. D1907 – Yarn Denier Skein Method
 - c. D2256 – Yarn Tensile & Elongation
 - d. D3218 – Yarn Thickness, Microns
 - e. D5823 – Pile Height
 - f. D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering
 - g. D5793 – Stitch Gauge
 - h. D1335 - Standard Test Method for Tuft Bind of Pile Yarn Floor Covering
 - i. D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
 - j. F1015 - Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
 - k. DIN 18-035 – Water Permeability
 - l. D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
 - m. D7138 – Melting Point

- n. F355 - Standard Test Method for Shock-Absorbing Properties of Playing Surfaces.
 - o. F1936 - Standard Test Method for Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field
 - p. F1951 – ADA Compliance
 - q. F2117-01 – Ball Rebound
 - r. D792 – Specific Gravity
 - s. EN 14808 – Force Reduction
 - t. EN 14809 – Vertical Deformation
 - u. EN 15301-1 – Rotational Resistance
 - 1) SUBMITTALS
- C. General: Make Submittals in accordance with the GENERAL REQUIREMENTS.
- D. Shop Drawings:
- a. Indicate field layout; field marking plan and details for the specified sports; i.e., soccer, men’s lacrosse, women’s lacrosse, field hockey, etc; roll/seaming layout; methods of attachment, field openings and perimeter conditions.
 - b. Show installation methods and construction indicating field verified conditions, clearances, measurements, terminations, drainage.
 - c. Provide joint submission with related trades when requested by Architect/Engineer.
- E. Product Data:
- a. Submit manufacturer's catalog cuts, material safety data sheets (MSDS), brochures, specifications; preparation and installation instructions and recommendations; storage, handling requirements and recommendations.
 - b. Submit fiber manufacturer's name, type of fiber and composition of fiber.
 - c. Submit data in sufficient detail to indicate compliance with the contract documents.
 - d. Submit manufacturer's instructions for installation.
 - e. Submit manufacturer's instructions for maintenance for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.
- F. Samples for Verification: For the following products, in manufacturer's standard sizes.
- a. A 12-inch x 12-inch, minimum sample of the exact synthetic turf that is specified for this project.
- G. Product Certification:
- a. Submit manufacturer’s certification that products and materials comply with requirements of the specifications.
 - b. Submit test results indicating compliance with Reference Standards.
- H. Project Record Documents: Record actual locations of seams, drains and other pertinent information in accordance with Division 1 Specifications Series, General Requirements.
- I. List of existing installations: Submit list including respective Owner’s representative and telephone number.
- J. Warranties: Submit warranty and ensure that forms have been completed in Owner's name and registered with approved manufacturer.

- K. Testing Certification: Submit certified copies of independent (third-party) laboratory reports on ASTM testing:
- a. D1577 - Linear Density of Textile Fiber
 - b. D1907 – Yarn Denier Skein Method
 - c. D2256 – Yarn Tensile & Elongation
 - d. D3218 – Yarn Thickness, Microns
 - e. D5823 – Pile Height
 - f. D5848 - Mass Per Unit Area of Pile Yarn Floor Covering
 - g. D5793 – Stitch Gauge
 - h. D1335 - Tuft Bind of Pile Yarn Floor Covering
 - i. D5034 - Breaking Strength and Elongation of Textile Fabrics (Grab Test)
 - j. F1015 - Relative Abrasiveness of Synthetic Turf Playing Surfaces
 - k. DIN 18-035 – Water Permeability
 - l. D2859 - Ignition Characteristics of Finished Textile Floor Covering Materials
 - m. D7138 – Melting Point
 - n. F355 - Shock-Absorbing Properties of Playing Surfaces.
 - o. F1936 - Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field
 - p. F1951 – ADA Compliance
 - q. F2117-01 – Ball Rebound
 - r. D792 – Specific Gravity
 - s. EN 14808 – Force Reduction
 - t. EN 14809 – Vertical Deformation
 - u. EN 15301-1 – Rotational Resistance
- L. Baseline Testing: Compile, prepare and submit a comprehensive baseline testing report of the in-situ field systems upon turf system installation completion and initial acceptance by the Owner in conformance with Section 1.10 – MAINTENANCE, TESTING AND SERVICE PACKAGE
- 1) QUALITY ASSURANCE
- M. Comply with the GENERAL REQUIREMENTS.
- N. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section. The turf contractor and/or the turf manufacturer:
- a. Shall be experienced in the manufacture and installation of specified type of synthetic infill monofilament and/or slit-film grass system for a minimum of three years with the same manufacturer, product and company they are proposing for this field. This includes use of a monofilament fiber and/or a slit-film fiber in addition to the backing, the backing coating, and the installation method.
 - b. Shall have a preferred in-house maintenance crew and/or installation partner assigned specifically to the project that is a member of the American Sports Builders Association and is a Certified Field Builder.
 - c. Shall have manufactured a minimum of twenty million (20,000,000) square feet of tufted turf for sports field use in the past five (5) years
 - d. Shall have installations in place that are a minimum of six (6) years old, of the specific type (or substantially equal type) of turf to be used on this project. This includes the tufting, backing, backing coating, and installation method.
 - e. Shall have a minimum of ten (10) NCAA Division I and/or 3 MLS or professional equivalent game or practice fields installed for soccer in the last eight years.

- f. Have installed a minimum of fifty (50) full sized synthetic turf fields with similar characteristics, within the past four (4) years.
- O. Installer: Company shall specialize in performing the work of this section. The Contractor shall provide competent workmen skilled in this specific type of synthetic grass installation.
 - a. The designated Supervisory Personnel on the project shall be certified, in writing by the turf manufacturer, as competent in the installation of specified monofilament and/or slit-film material, including sewing seams and proper installation of the infill mixture.
 - b. Installer shall be certified by the manufacturer and licensed.
 - c. The installer supervisor shall have a minimum of 5 years' experience as either a construction manager or a supervisor of synthetic turf installations
- P. Pre-Installation Conference: Conduct conference at project site at time to be determined by Architect/Engineer. Review methods and procedures related to installation including, but not limited to, the following:
 - a. Inspect and discuss existing conditions and preparatory work performed under other contracts.
 - b. In addition to the Contractor and the installer, arrange for the attendance of installers affected by the Work, The Owner's representative, and the Architect/Engineer.
- Q. The Contractor shall verify special conditions required for the installation of the system.
- R. The Contractor shall notify the Architect/Engineer of any discrepancies.
 - 1) DELIVERY, STORAGE AND HANDLING
- S. Prevent contact with materials that may cause dysfunction.
- T. Deliver and store components with labels intact and legible.
- U. Store materials/components in a safe place, under cover, and elevated above grade.
- V. Protect from damage during delivery, storage, handling and installation. Protect from damage by other trades.
- W. Inspect all delivered materials and products to ensure they are undamaged and in good condition.
- X. Comply with manufacturer's recommendations.
 - 1) SEQUENCING AND SCHEDULING
- Y. Coordinate the Work with installation of work of related trades as the Work proceeds.
- Z. Sequence the Work in order to prevent deterioration of installed system.
 - 1) SYNTHETIC TURF WARRANTY
- AA. Warranty: The Synthetic Turf Contractor shall submit it Manufacturer's Warranty, which guarantees the usability and playability of the synthetic turf system for its intended uses for a minimum eight (8) year period commencing with the date of Substantial Completion.

- a. Special Warranty – The installed synthetic turf system must maintain an ASTM F-355 Gmax of less than 175 and an ASTM F355-16 Head Injury Criterion of less than 1,000 HIC at a fall height of 1.3 meters for the life of the Synthetic Turf Manufacturer's warranty.

BB. The warranty submitted must have the following characteristics:

- a. Must provide full-field coverage for a minimum eight (8) years from date of Substantial Completion.
- b. 2. Must warrant materials and workmanship.
- c. 3. Must warrant that the materials installed meet or exceed the product specifications within manufacturing tolerances.
- d. 4. Must have a provision to either repair or replace such portion of the installed materials that are no longer serviceable to maintain a serviceable and playable surface.
- e. 5. Must be a Manufacturer's warranty from a single source covering workmanship and all self-manufactured or procured materials.
- f. 6. Warranties for the synthetic turf field systems shall address the following:
 - 1) a. Acceptable uses for the field
 - 2) b. Fading
 - 3) c. Color match within specifications
 - 4) d. Excessive fiber wear
 - 5) e. Wrinkling and panel movement
 - 6) f. Shock absorbtion
 - 7) g. Seam Integrity
 - 8) h. Drainage - Turf
 - 9) i. Flammability
 - 10) j. Response time for required repairs/replacement

PART 2 PRODUCTS

3.01 APPROVED MANUFACTURERS/SUPPLIERS

A. Approved Synthetic Turf Manufacturers/Suppliers

- 1. ACT Global: actglobal.com
- 2. Astroturf: astroturf.com
- 3. FieldTurf: fieldturf.com
- 4. Shaw Sports Turf: shawsportsturf.com
- 5. Sprinturf: sprinturf.com
- 6. TenCate: tencategrass.com
- 7. Owner approved equal.

3.02 MATERIALS & EQUIPMENT

- A. The procurement of the synthetic turf playing field system is to include a turf sweeper and grooming brush, which consists of a field sweeper and separate grooming brush designed to groom the exposed grass fibers to keep them from matting down excessively. This equipment shall be approved by the Manufacturer and the Owner to be used as directed by the Manufacturer. No additional payment will be made for providing the equipment, but the costs for providing the equipment shall be included in the price bid for the synthetic turf. The equipment shall include the manufacturer's standard warranty and Owner training.

PART 3 EXECUTION

4.01 EXECUTION

- A. See Section 32 92 11 – SYNTHETIC TURF PLAYING FIELD SYSTEMS for the turf fabric installation requirements/procedures.

END OF SECTION 32 92 05

SECTION 32 92 11 - SYNTHETIC TURF PLAYING SURFACE

SYNTHETIC TURF PLAYING FIELD SYSTEM

PART 1 GENERAL

2.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.02 SUMMARY

- A. This Section includes the following:
 - 1. Furnishing all labor, materials, tools and equipment necessary to install, in place, all synthetic turf as indicated on the plans and as specified herein. The installation of all new materials shall be performed in strict accordance with the manufacturer's written installation instructions, and in accordance with all approved shop drawings.
- B. Related Sections
 - 1. Section 32 92 05 – SYNTHETIC TURF PLAYING FIELD SYSTEM: PROJECT REQUIREMENTS AND CONDITIONS – Manufacturer/Contractor's required qualifications, quality assurance, submittals and warranty.

PART 2 PRODUCTS

3.01 MATERIALS AND PRODUCTS

- A. Synthetic turf system materials shall consist of the following:
 - 1. Carpet made of a combination of monofilament polyethylene fiber, slit-film, and rootzone polyethylene fibers into a free-draining perforated backing with a 1-1/8" minimum pile height.
 - 2. Infill
 - a. Install infill, if required, as per Manufacturer's requirements.
 - 3. Glue, thread, paint, seaming fabric and other materials used to install and mark the playing surface.
- B. The installed artificial playing surface shall have the following physical characteristics (+/-5%) as tested according to ASTM F1551 Standard Test Methods for Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials:

Property	Value	Units	ASTM
Pile Yarn Type	UV-resistant polyethylene		n/a
Yarn Structure	Monofilament Slit Film Root Zone		n/a
Yarn Denier	5,400 5,040 7,200	Denier	D1577
Yarn Breaking Strength	>20 nominal	lbs	D2256
Yarn Maximum Elongation	>50 nominal	%	D2256
Pile Height	1-1/8"	inches	D5823
Pile Weight	90	Oz/yd2	D5848
Primary Backing Weight	7 +	Oz/yd2	D5848
Secondary Backing Weight	20 +	Oz/yd2	D5848
Total Weight	117 +	Oz/yd2	D5848
Stitch Gauge	3/8"		D5793
Tuft Bind	>9	lbs/force	D1335
Grab Tear Length	>200	lbs/force	D5034
Grab Tear Width	>200	lbs/force	D5034
Pill Burn Test	Pass		D2859
Yarn Melting Point	>245	Degrees F	D7138
Impact Attenuation (Gmax)	<160	GMax	F355
Water Permeability	>60	inch/hour	DIN 18-035
Infill Material	2.25	lb/sf	n/a

- C. Carpet Rolls shall be 15' wide rolls.
 - 1. Rolls shall be long enough to go from field sideline to sideline.
 - 2. The perimeter white line shall be tufted into the individual sideline rolls, where applicable.
- D. Backing:
 - 1. Primary backing shall be a double-layered polypropylene fabric treated with UV inhibitors.
 - 2. Secondary backing shall consist of an application of a heat-activated urethane to permanently lock the fiber tufts in place.
- E. Non-tufted or inlaid lines and markings shall be painted with paint approved by the synthetic turf manufacturer.
- F. Thread for sewing seams of turf shall be compatible by the synthetic turf manufacturer.

- G. Glue and seaming fabric for inlaying lines and markings shall be compatible by the synthetic turf manufacturer.

3.02 QUALITY CONTROL IN MANUFACTURING

- A. The manufacturer shall own and operate its own manufacturing plant in North America.
- B. The manufacturer shall have full-time certified in-house inspectors at their manufacturing plant that are experts with industry standards.
- C. The manufacturer's full-time in-house certified inspectors shall perform pre-tufting fiber testing on tensile strength, elongation, tenacity, denier, shrinkage, and twist i.e., turns per inch, upon receipt of fiber spools from fiber manufacturer.
- D. Primary backing shall be inspected by the manufacturer's full-time certified in-house inspectors before tufting begins.
- E. The manufacturer's full-time in-house certified inspectors shall verify "pick count", yarn density in relation to the backing, to ensure the accurate amount of face yarn per square inch.
- F. The manufacturer's full-time, in-house, certified inspectors shall perform turf inspections at all levels of production including during the tufting process and at the final stages before the turf is loaded onto the truck for delivery.
- G. The manufacturer shall have its own, in-house laboratory where samples of turf are retained and analyzed, based on standard industry tests, performed by full-time, in-house, certified inspectors.

PART 3 EXECUTION

4.01 EXAMINATION

- A. Verify that all sub-base leveling is complete prior to installation.
- B. Installer shall examine the surface to receive the synthetic turf and accept the sub-base planarity in writing prior to the beginning of installation.
 - 1. Acceptance is dependent upon the Contractors test results indicating compaction and planarity are in compliance with manufacturer's specifications.
 - 2. The surface shall be accepted by Installer as "clean" as installation commences and shall be maintained in that condition throughout the process.
- C. The surface tolerance shall not exceed 0-1/4 inch over 10 feet and 0-1/2" from design grade.
- D. Correct conditions detrimental to timely and proper completion of Work.
- E. Do not proceed until unsatisfactory conditions are corrected.
- F. Beginning of installation means acceptance of existing conditions

4.02 PREPARATION

- A. Prior to the beginning of installation, inspect the sub-base for tolerance to grade.
- B. Sub-base acceptance shall be subject to receipt of test results (by others) for compaction and planarity that sub-base is in compliance with manufacturer's specifications and recommendations.
- C. Dimensions of the field and locations for markings shall be measured by a registered surveyor to verify conformity to the specifications and applicable standards. A record of the finished field as-built measurements shall be made.
- D. When requested by Architect/Engineer, installed sub-base shall be tested for porosity prior to the installation of the synthetic turf. A sub-base that drains poorly is an unacceptable substrate.

4.03 INSTALLATION – GENERAL

- A. The installation shall be performed in full compliance with approved Shop Drawings.
- B. Only trained technicians, skilled in the installation of athletic caliber synthetic turf systems working under the direct supervision of the approved installer supervisors, shall undertake any cutting, sewing, gluing, shearing, topdressing, or brushing operations.
- C. The designated Supervisory personnel on the project must be certified, in writing by the turf manufacturer, as competent in the installation of this material, including sewing seams.
- D. Designs, markings and layouts shall first be approved by the Architect or Owner in the form of final shop drawings. All markings will be in full compliance with final shop drawings.

4.04 INSTALLATION

- A. Install at location(s) indicated, to comply with final shop drawings, manufacturers'/installer's instructions.
- B. The Contractor shall strictly adhere to specified procedures. Any variance from these requirements shall be provided in writing, by the manufacturer's on-site representative, and submitted to the Architect and/or Owner, verifying that the changes do not in any way affect the Warranty.
- C. Full width rolls shall be laid out across the field.
 - 1. Turf shall be of sufficient length to permit full cross-field installation from sideline to sideline.
 - 2. No cross seams will be allowed in the main playing area between the sidelines.
 - 3. Each roll shall be attached to the next roll utilizing standard state-of-the-art sewing procedures.
 - 4. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed at right angles to the playing surface.
- D. Artificial turf panel seams shall be sewn or glued per manufacturer's turf system installation specifications.
 - 1. Seams shall be flat, tight, and permanent with no separation or fraying.

2. In the case of all lines and logos, turf carpet must be sheared to the backing (do not cut the backing) and adhered using hot melt adhesives.
- E. Non-tufted or inlaid lines and markings shall be painted in accordance with turf and paint manufacturers' recommendations. Number of applications will be dependent upon installation and field conditions.
- F. Synthetic turf shall be attached to the perimeter edge detail in accordance with the manufacturer's standard procedures.
- G. Upon completion of installation, the finished field shall be inspected by the installation crew and an installation supervisor.

4.05 FIELD MARKINGS

- A. Field markings shall be installed in accordance with approved shop drawings.
- B. Field markings will be inlaid or painted in accordance with the Drawings.

4.06 ADJUSTMENT AND CLEANING

- A. Do not permit traffic over unprotected surface.
- B. Contractor shall provide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.
- C. All usable remnants of new material shall become the property of the Owner.
- D. The Contractor shall keep the area clean throughout the project and clear of debris.
- E. Surfaces, recesses, enclosures, and related spaces shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the Owner.

4.07 PROTECTION

- A. Protect installation throughout construction process until date of final completion.

END OF SECTION 32 92 11

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SECTION 32 9 2 10 - SYNTHETIC TURF - DRAINAGE & BASE

SYNTHETIC TURF PLAYING FIELD SYSTEM

SUBSURFACE DRAINAGE & AGGREGATE BASE

PART 1 GENERAL

3.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

3.02 SUMMARY

- A. This Section includes the following:
 - 1. Furnishing all labor, materials, tools and equipment necessary to install, in place, all subsurface drainage and aggregate base materials as indicated on the plans and as specified herein. The installation of all new materials shall be performed in strict accordance with the Selected Turf Manufacturer's written installation instructions, and in accordance with all approved shop drawings. Any variance from these requirements must be accepted in writing, by the Selected Turf Manufacturer's on-site representative, and submitted to the University, verifying that the changes do not in any way affect the warranty.
- B. Related Sections
 - 1. SECTION 32 92 05 – SYNTHETIC TURF PLAYING FIELD SYSTEM: PROJECT REQUIREMENTS AND CONDITIONS
 - 2. SECTION 32 92 11 – SYNTHETIC TURF PLAYING SURFACE

3.03 REFERENCES

- A. ASTM International:
 - 1. Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates (ASTM C-136-96a).
 - 2. Standard Classification for Sizes of Aggregate for Road and Bridge Construction (ASTM D-448-03a).
 - 3. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)) (ASTM D-698-00a).
 - 4. Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method (ASTM D-1556-00).
 - 5. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 lb-lbf/ft³ (2,700 kN-m/m³)) (ASTM D-1557-00).
 - 6. Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) (ASTM D-2487-00).

7. Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth) (ASTM D-2922-96e1).
8. Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth) (ASTM D-3017-96e1).
9. Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density (ASTM D-4254-00).

PART 2 PRODUCTS

4.01 MATERIALS

A. Perforated (Flat) Panel Drains:

1. Pipe shall be a 12" standard perforated "panel-type" design, installed in a 45° herringbone orientation, with a geotextile wrap. Panel shall have a minimum compressive strength of 3000lbs/ft² tested normal to the plane and 1500lb/ft² tested at 50o from normal at 20% deflection (ASTM D2412).
 - a. Basis of Design: Hydraway: 1"x12" pipe
 - 1) -OR-
 - b. Owner/Engineer Approved Equal

B. Aggregate Base: Type 2 Base Stone: Crushed #57 limestone meeting the following gradation specifications:

Sieve Size	Percent Passing
1 - 1/2"	100
1"	95 to 100
1/2"	25 to 60
#4	0 to 10
#8	0 to 5

a. C. Finishing/Leveling Stone: Crushed "#8" limestone screenings:

1. The upper 2" thickness of gravel below the carpet shall meet the following gradations or as required and approved by the turf contractor.

Sieve Size	Percent Passing
1/2"	100
3/8"	85 to 100
#4	10 to 30
#8	0 to 10
#16	0 to 5

2. These gradation specifications are provided for guidance only. It is the sole responsibility of the turf contractor to select and install a finishing gravel that will provide sufficient surface stability and vertical drainage capacity to meet the performance criteria and warranty requirements of these specifications.

C. D. Perimeter Edge: A perimeter concrete curb with a composite wood-polymer nailer board, 2x4 nominal dimension.

1. E. Geotextile fabric: Mirafi 140N, or equal, with the following characteristics

TENSILE STRENGTH	120 LBS.
ELONGATION AT BREAK	50 %
MULLEN BURST	225 PSI
PUNCTURE STRENGTH	310 LBS.
TRAPEZOIDAL TEAR	50 LBS.
APPARENT OPENING	70 US SIEVE
PERMITTIVITY	1.7 SEC-1
UV RESISTANCE RETAINED	70%
FLOW RATE	135 G/M/SF

2. F. Collector Pipes: Perforated, corrugated High Density Polyethylene (HDPE) Pipe and Fittings at the diameter shown on the Drawings, meeting the material requirements specified in Section 33 40 00 – Storm Drainage Utilities.
 - a. Basis of Design: Advanced Drainage Systems: Perforated Dual Wall N-12 pipe.
 - 1) -OR-
 - b. Owner/Engineer Approved Equal

PART 3 EXECUTION

5.01 GENERAL

A. Sub-Grade Preparation:

1. The soil bed or subgrade is to be sloped to match the proposed finished surface grades or as indicated in the Drawings.
2. The soil bed or sub-grade must be compacted in both directions to attain the compaction rate specified in Section 31 22 01 – FIELD GRADING.
3. The soil bed or subgrade must be prepared to tolerances of not more than 1/4" from design grade to allow for even drainage.
4. Cover the prepared subgrade with the Geotextile fabric, overlapping the seams a minimum of 12" in the direction the runoff flows.

B. Installation of Collector Pipes:

1. Excavate drainage collector trenches minimum 20" wide to the invert depth and longitudinal slope shown on the Drawings. Collection trenches should be void of all debris.
2. Place geotextile fabric in the trenches first, overlapping the seams a minimum of 12" in the direction the runoff flows. The fabric in the trenches is to be separate from the fabric on the field. Overlap field and trench liners at least 18" in the direction of runoff flow.
3. Place a minimum of 2" clean, Aggregate Base material in the bottom of the collector trenches, on top of the geotextile and compacted to a minimum 98% of the maximum dry density.
4. Place the collector pipes in the trenches. The centerline of the pipe shall coincide with the centerline of the trench. Pre-manufactured fittings shall be used for all connections into the collector drainage network.

5. Backfill trench with Aggregate Base material specified above and compact to a minimum 98% of the maximum density, placing a minimum of 4" clean, crushed aggregate on the sides of the underdrain pipes and collectors, and 6" minimum of the aggregate on top of the pipe network.
- C. Installation of the perforated (flat) panel drains:
1. Install perforated (flat) panel underdrain system in a 45° herringbone pattern at spacing on center as shown on the Drawings.
 2. Tape the underdrain pipes every 15 feet to the fabric with waterproof tape.
 3. Use due care when applying aggregate not to crush or otherwise damage the panel drains.
- D. Installation of Type 2 Aggregate Base Stone Course:
1. Place base stone without damaging or disturbing the prepared subgrade soil bed, geotextile fabric liner or flat panel drains. Do not create any depressions in the subgrade. Stone shall be damp when transported to site and shall be kept damp during installation, to minimize segregation of the materials.
 2. Compact base course to a minimum depth of 4" in all areas of the field. Slope top of stone layer to match the proposed finished surface grades as indicated in the Drawings. Where the compacted depth of the base course exceeds 6", install in two layers of approximate equal thickness. Each layer must be compacted in both directions to a minimum 98% of the maximum density.
 3. The grade of the base course shall not vary from the specified grade by more than 1/4" from design grade.
- E. Finishing Stone
1. The final grade aggregate layer should not be more than 2" deep.
 2. The final grade material must be sloped 0.5% from the center longitudinal axis towards the field perimeter unless otherwise specified.
 3. The final grade must be compacted in both directions to attain the specified compaction rate of 98% standard Proctor.
 4. The final grade of the finishing stone shall not vary from the specified grade by more than 1/4" from design grade, nor by more than 1/4" in 10ft. Laser guided grading is highly recommended.
- F. Synthetic Turf and Infill Material: Install in conformance with SECTION 32 92 11 – SYNTHETIC TURF PLAYING SURFACE.

END OF SECTION 32 92 10

SECTION 33 30 00 - SANITARY SEWERAGE SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The work included under this section consists of furnishing all labor, equipment, and materials necessary for the construction of sanitary sewers, sewer connections and appurtenances as shown on the Drawings or specified herein.

1.02 RELATED WORK

- A. Section 31 23 16 - Excavation
- B. Section 31 23 23 - Backfilling
- C. Section 31 23 33 - Trenching: Backfill and Compacting for Utility Systems.
- D. Section 32 13 10 - Concrete (Sitework).
- E. Section 32 13 13 - Concrete Paving.

1.03 QUALITY ASSURANCE

- A. Design Requirements: Sewer pipe shall be laid with a minimum separation of ten (10) feet from a parallel water pipeline, and 18" minimum vertical clearance.
- B. Storage: Polyvinyl chloride pipe shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the polyvinyl chloride pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

1.04 SUBMITTALS

- A. Shop Drawings
 - 1. In general, six (6) copies of the following data or shop drawings shall be submitted to the Engineer for approval prior to construction:
 - a. Precast manholes.
 - b. Manhole frames, covers and other castings.
 - c. Manufacturer's Certified test report on castings.
 - d. Certified test records for polyvinyl chloride pipe.
 - e. Mill Test Certificates on ductile iron pipe.
 - f. Electronic marker and locator.
 - g. Pipe adapters.

- B. Record Information: The Contractor shall submit to the Engineer the stations and left or right offsets of all services (terminal ends) as measured from the nearest downstream manhole along the center line of the sewer, along with the elevations of the north edge of the manhole covers and inverts of all pipes in the manholes.

1.05 REFERENCES

- A. AASHTO T-180/ANSI/ASTM D1557 - Moisture-Density Relations of Soils.
- B. AASHTO T99/ANSI/ASTM 0698 - Moisture-Density Relations of Soils.
- C. ANSI Std. A21.51 for Ductile Iron Pipe ASTM A746.
- D. ASTM D1248 - Vinyl Lining for Pipe.
- E. ASTM A48 - Cast Iron Appurtenances.
- F. ASTM C32 - Brick
- G. ASTM D1785 - Polyvinyl Chloride (PVC) Plastic Pipe Schedule 40, 80, 120.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable Florida Department of Environmental Regulation, and permit requirements or procedures.
- B. Conform to applicable municipality or utility to assume maintenance at the completion of construction.

1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated.

1.08 SUBMITTALS

- A. Submit in accordance with Division 1 requirements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Plastic gravity sewer pipe and fittings shall be polyvinyl chloride (PVC) and conform to the requirements of ASTM Designation D 3034, Type PSM, SDR-35. Large diameter plastic gravity sewer pipe and fittings (18 to 27 inch) shall conform to the requirements of ASTM Designation F679. Elastomeric gasket joints shall conform to ASTM Designation F477. PVC pipe and fittings shall be as manufactured by Johns-Manville, CertainTeed or approved equal.

- B. Ductile iron sewer pipe shall conform to the requirements of ANSI Standard A21.51, Class 50 (ASTM Designation A 746, Class 50). Pipe smaller than twelve (12) inches shall have a bituminous coating on the inside, and pipe twelve (12) inches and larger shall be polyethylene lined. Bituminous coating shall be applied to the outside of pipe as specified in ANSI standard A21.51. Joints shall be mechanical or push-on and conform to ANSI A21.11. Gaskets shall be of neoprene and shall have plain tips unless otherwise specified.
- C. Virgin polyethylene for pipe lining shall comply with ASTM Designation D 1248 and shall be compounded with enough carbon black during manufacture to resist ultraviolet rays during above ground storage. The polyethylene lining shall be fused in place, approximately 20 mils. (.02 inches) in thickness, shall be tightly adherent to the pipe wall and shall extend from the spigot end to the gasket seat in the bell socket. The inside surface of the pipe to be lined with polyethylene shall be thoroughly ground and cleaned of oil, dirt, and foreign matter.
- D. Concrete and reinforcing steel shall conform to the requirements of Section 32 13 10. Concrete classes for the various purposes shall be as follows:
 - 1. Manhole bottoms, Class A.
 - 2. Precast manholes, Class B minimum
 - 3. Pipe and riser encasement, Class C.
 - 4. Protective slabs, Class C.
- E. Gray iron castings for manhole frames, covers and other items shall conform to the ASTM Designation A 48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions, which would impair their strength, or otherwise make them unfit for the service intended. The seating surfaces between frames and covers shall be machined to fit true. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided but shall not penetrate the cover. Casting patterns shall conform to those shown or indicated on the drawings. The words SANITARY SEWER, as well as the municipality or county shall be cast in all manhole covers. All manhole frames and covers shall be traffic bearing unless otherwise specified.
- F. Brick for manhole construction shall be dense, hard burned, shale or clay brick conforming to ASTM Designation C32, Grade MM or C62, Grade MW, except that brick absorption shall be between five (5) and twenty-five (25) grams of water absorbed in one (1) minute by dried brick, set flat face down, in 1/8 inch of water.
- G. Cement mortar for manhole construction shall be one (1) part cement and three (3) parts clean sharp sand to which may be added lime in the amount of not over ten percent (10 %) volume of cement. It shall be mixed dry and then wetted to proper consistency for use. No mortars that have stood for more than one (1) hour shall be used.
- H. Pipe Adapter:
 - 1. Donut pipe adapter shall be manufactured from virgin polyvinyl chloride (PVC) or polyurethane adaptable to similar or dissimilar pipes of the same or different sizes. Donuts shall be as manufactured by Fernco Joint Sealer Company, Dickey Company or approved equal.
 - 2. Flexible couplings shall be manufactured from virgin polyvinyl chloride (PVC) or polyurethane adaptable to dissimilar pipes of the same or different sizes. The flexible couplings shall be as manufactured by Fernco Joint Sealer Company, Can-Tex or approved equal and supplied with #300 stainless steel bands.

3. Flexible manhole sleeves for connecting sewer pipe to precast manholes shall be of a synthetic rubber compound resistant to ozone, weather, acid, and water. The sleeve shall have a cast-in-place water stop and accommodate settlement up to 15° (degrees). The binding of the sleeve to the pipe shall be a non-corrosive, non-magnetic type 300 stainless steel strap.
- I. The electronic marker shall be constructed of high-density polyethylene. The marker shall be a passive device capable of operating at a depth of six (6) feet with a special response, frequency and be the color for sanitary use to conform to APWA's, Uniform Markings and Surface Field Identification by Uniform Color Code Standards. The marker shall be designed to have a forty (40) year life.
- J. Coat Tar Epoxy: Coal tar epoxy shall be Koppers Bitumastic No. 300M, Tnemec Tneme-Tar No. 46-413 or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that the trench, bedding, and connections to existing sewers are ready to receive work and are as indicated on drawings.

3.02 PREPARATION

- A. Upon satisfactory installation of the pipe bedding, as specified in Section 31 23 33, a continuous trough for the pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous uniform support and no pressure shall be exerted on the pipe joints from the trench bottom.
 1. The interior of all pipes shall be thoroughly cleaned of all foreign material before being lowered in the trench and shall be kept clean during laying operations by means of plugs, or other approved methods. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe laid to prevent mud or other foreign material from entering the pipe.

3.03 INSTALLATION

- A. Pipe:
 1. Pipe laying shall proceed upgrade with spigot ends pointing in the direction of flow. Before pipe is joined, gaskets shall be cleaned of all dirt and stones and other foreign material. The spigot ends of the pipe and/or pipe gaskets shall be lubricated lightly with a lubricant as specified by the pipe manufacturer and approved by the Engineer. Sufficient pressure shall be applied to the pipe so as to properly seat the socket into the bell of the pipe. All pipe shall be laid straight, true to the lines and grades shown on the Drawings in each manhole section.
 2. Any pipe which is disturbed or found to be defective after laying shall be taken up and re-laid or replaced.
 3. Polyvinyl Chloride Pipe:
 - a. Transportation: Care shall be taken during transportation of the pipe that it is not cut, kinked, or otherwise damaged.

- b. Handling Pipe Lengths: Ropes, fabric or rubber protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two (2) slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped onto rocky or unprepared ground.
- c. Handling Pipeline: The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Sections of the pipes with deep cuts and gouges shall be removed.
- d. Lowering Pipe into Trench: Care shall be exercised when lowering pipe into the trench to prevent damage to or twisting of the pipe.
- e. Special Precautions: Polyvinyl chloride pipe connected to heavy fittings, manholes and rigid structures shall be supported in such a manner that no subsequent relative movement between the pipe and the joint with the rigid structures is possible.

B. Service Connections:

- 1. Service connections, of the type called for on the Drawings, shall be provided in accordance with the details therefore as shown or indicated on the Drawings.
- 2. Where called for on the drawings, sewer pipe of the size and type noted shall be extended to the street right-of-way line and plugged with an approved removable plastic plug. All connections and changes of direction shall be made using standard fittings designed for the purpose.
- 3. An electronic marker shall be placed at least six (6) inches above each sanitary sewer service connection, at the property line. The unit shall be used in locating the service line for future connection. The marker shall be buried in a level position and at a depth of not less than two (2) feet and not more than five (5) feet.

C. Concrete Encasement:

- 1. Class C concrete encasement shall be constructed in accordance with details shown on the Drawings. Encasement shall be constructed where:
 - a. The sewer or service pipe shall have less than thirty (30) inches of cover between the top of the pipe and the final top of pavement or ground line.
 - b. The PVC sewer or service pipe crosses over, or at a depth which provides less than eighteen (18) inches clear distance between pipes when crossing under water mains. Encasement shall extend a minimum of ten (10) feet on each side of the point of crossing.
 - c. The lateral separation of the PVC sewer pipe and potable water piping is less than ten (10) feet.
 - d. The Engineer shall order the line encased.
- 2. Payment for the above described work shall be made at the unit price stated in the Proposal.
- 3. If, through failure to provide suitable trench sheeting, or other causes, the maximum width for trench excavations, as specified elsewhere in these specifications, is exceeded, the Contractor shall construct concrete encasement around the pipe for the length of the excessive excavation. No payment will be made for the concrete encasement required due to excessive trench widths.
- 4. The points of beginning and ending of sewer, or service pipe encasement shall be not more than six (6) inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

D. Manholes:

1. Brick Manholes:

- a. All brick manholes shall be constructed of brick, concrete and cement mortar, with cast iron frames and covers in accordance with the details shown on the Drawings. All brick shall be thoroughly wet before laying up and shall be laid with a shove joint in full mortar beds and shall be thoroughly sloshed up with mortar at every course. Standard manholes shall have a depth measured from manhole top to lowest invert and not more than six (6) feet. Standard manholes with extra depth shall be over, or in excess of six (6) feet from manhole frame top to lowest invert.
- b. Where shown on the Drawings, the Contractor shall place stub-outs for future extensions. Both the manhole and exterior ends of all such stub-outs shall be closed with watertight plugs removable without damage to the pipe. One (1) section of pipe, one (1) foot long, shall be laid at each manhole stub-out.
- c. Outside drop connections shall be made in accordance with the details therefore shown on the Drawings.
- d. The invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section. Steep slopes outside the invert channels shall be avoided. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer or entering branch shall be a smooth curve with radius as long as practicable. Invert channels shall also be formed for pipe stub-outs.
- e. All manholes shall be plastered inside and outside with 1/2-inch thickness of cement mortar. The manhole interior walls shall be coated with two (2) applications of coal tar epoxy (16 mils dry total thickness). The cement mortar shall be permitted to cure not less than three (3) days before application of the coating.
- f. Frames and covers shall be set accurately to grade to conform to the finished grade of the adjacent areas.

2. Precast Concrete Manholes:

- a. Precast concrete manholes may only be used in lieu of brick manholes when the following conditions are satisfied:
 - 1) Details and shop drawings of the manholes, proposed to be furnished for this work, are submitted to, and approved by the Engineer prior to the manufacture of the units. Manholes which are not manufactured in strict compliance with the approved shop drawings and these specifications will be rejected.
 - 2) The design and manufacture of the manholes and special pipe construction at manholes shall conform to these specifications.
 - 3) Manhole excavation, bedding and pipe trench excavation and bedding at manhole junctions shall be performed in accordance with the provisions of Section 31 23 33.
- b. Precast manholes shall conform to the requirements of ASTM Designation C478 with reinforcement of Grade 40 bars and the following modifications thereto:
 - 1) The minimum shell thickness shall be eight (8) inches.
 - 2) Cement to be used in precast manholes shall be Type II.
 - 3) Joints, whose position in the complete structure are below an elevation of six (6) feet above sea level, shall be compression type, neoprene gasket joints of a design approved by the Engineer. the unfilled portion of the joint shall be filled with Ram-Nek plastic joint sealing compound. Height of wall sections shall not be less than three (3) feet.

- 4) Lifting holes through the structures are not permitted.
 - 5) The design of the structure shall include a precast base of not less than eight (8) inches in thickness poured monolithically with the bottom section of the manhole walls.
 - 6) All gasket used for sealing around pipe openings shall be of a type acceptable to the Engineer and designed for use in water. All openings and joints shall be sealed watertight.
 - 7) Precast manhole tops, if used, shall terminate at such elevations as will permit laying up brick courses under the manhole frame to make allowance for future street grade adjustments.
 - 8) Drop connections, where required on precast manholes, shall be manufactured with the manhole elements at the casting yard. The manufacturer shall submit for approval the method of drop manhole construction.
- c. The interior walls shall be coated with two (2) applications of coal tar epoxy applied as recommended by the coating manufacturer to form a 16 mil dry film thickness.
 - d. Shallow manholes may substitute an eight-inch precast reinforced slab on the top in lieu of the cone section. Slabs shall be laid in a full bed of mortar and pointed to form a dense joint.
 - e. Precast manholes that are installed in conjunction with PVC pipe shall utilize approved coupling adapters set in the concrete wall and with a stainless-steel band to join PVC pipe to concrete manholes.
 - f. The invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section. Steep slopes outside the invert channels shall be avoided. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer or entering branch shall be a smooth curve with radius as long as practicable. Invert channels shall also be formed for pipe stub-outs.
- E. Connections to Existing structures and Sewers:
1. Various sewer lines shall be connected to existing manholes and structures. Provisions have been made in some of the existing structures for future connections and may require only the removal of a plug and the connection of the proposed line, while other connections will require cutting into the existing structure. The Contractor shall exercise care in cutting into the existing structure and any damage done to the structure shall be repaired as required by the Engineer and at the Contractor's expense. Drop connections to existing manholes shall be installed as detailed on the Drawings for new construction.
 2. The drop connection for existing Manhole shall be constructed of SDR 35 polyvinyl chloride (PVC) pipe. Anchor straps shall be not less than 3/16 inches by 1/2 inches and constructed of AISI 304 stainless steel. Wall anchor bolts shall not be less than 5/8 inch and constructed of corrosion resistant metal.
- F. Additional Work: Additional items of construction such as cleanouts, terminal lamp holes, special manholes and other items necessary for the complete installation of the system shall conform to specific details on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these specifications.

3.04 FIELD QUALITY CONTROL

- A. Tests, Inspections and Acceptance of Materials and Workmanship:
1. Workmanship: It is imperative that all sewers and appurtenances be built practically watertight and that the Contractor adhere rigidly to the specifications for materials and workmanship. All of the sewage must be pumped for disposal and special care and attention must be paid to securing watertight construction. Upon completion, the sewers, or sections thereof, will be tested and gauged, and if leakage is above the allowable limits specified, the sewer will be rejected.
 2. Inspection:
 - a. On completion of each block or section of sewer, or such other times as the Engineer may direct, the block or section of sewer shall be cleaned, tested, and inspected. Each section of the sewer shall show, on examination from either end, a full circle of light between manholes.
 - b. Each manhole or other appurtenance to the system shall be of the specified size and form, be watertight, neatly, and substantially constructed with the top set permanently to exact position and grade. All repairs shown necessary by the inspection shall be made; broken or cracked pipe replaced; all deposits removed, and the sewer left true to line and grade, entirely clean, and ready for use.
- B. Limits of Infiltration, Exfiltration and Testing:
1. The allowable limits of infiltration or leakage for the entire system or any portion thereof, including house service lines, shall not exceed a rate of 0.1 gallon per foot of pipe per 24 hours for all sizes of pipe throughout the system. The allowable limits of infiltration of manholes shall not exceed a rate of four (4) gallons per manhole per 24 hours.
 2. Infiltration, if taken between any two (2) adjacent manholes, shall not exceed 0.1 gallon per 24 hours per foot of sewer for all sizes and all locations. This testing of lines between adjacent manholes will not be required except to localize the position of a leak in a portion of the system that exceeds the allowable leakage limit, or as directed by the Engineer.
 3. Any part or all of the system may be tested for infiltration or exfiltration, as directed by the Engineer. Prior to testing for infiltration, the system shall be pumped out so that normal infiltration conditions exist at the time of testing. The amounts of infiltration or exfiltration shall be determined by pumping into or out of calibrated drums, or by other approved methods.
 4. The exfiltration test will be conducted by filling the portion of the system being tested with water to a level which will provide: a minimum head on a service lateral connected to the test portion of two (2) feet; or in the event there are no service laterals in the test portion, a minimum difference in elevation of five (5) feet between the crown of the highest portion of the sewer and the test level.
 5. Tests shall be conducted on portions of the system not exceeding three (3) manhole runs or more than 1,000 feet of main sewer, or as otherwise directed by the Engineer. Tests shall run continuously for three (3) hours. Where infiltration or exfiltration exceeds the allowable limits also specified herein, the defective pipe, joints, or other faulty construction shall be located and repaired by the Contractor. If the defective portions cannot be located, the Contractor shall remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable limits. Testing shall be performed as the job progresses and shall be started after 3,000 feet of pipe are laid.

6. The Contractor shall provide all labor, equipment and materials and shall conduct all testing required, under the direction of the Engineer. No separate payment will be made for this work and the cost for this work shall be included in the price quoted in the proposal for the applicable item of work.

3.05 PROTECTION

- A. Protect pipe and backfill or cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 30 00

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SECTION 33 40 01 - STORM SEWERAGE SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The work covered and described in this Section includes the furnishing and construction of culverts, storm sewers, inlets and other drainage structures as shown on the Drawings and specified herein.

1.02 RELATED WORK

- A. Section 31 23 16 - Excavating
- B. Section 32 13 13 - Concrete Paving

1.03 SUBMITTALS

- A. Shop Drawings: Shop drawings for the following items shall be submitted for approval.
 - 1. Grates and castings
 - 2. Precast structures.
- B. Pipe certification of quality by producer shall be delivered to Engineer ten days prior to installation.

1.04 JOB CONDITIONS

- A. Existing Drainage System: Maintain operational, prevent siltation.
- B. Cleanup: Maintain surface grade within 400 feet of pipe laying operation.

1.05 REFERENCES

- A. T-180 - Moisture-Density Relations of soils using a 10-lb (4.54 kg) Rammer and an 18-inch (457 mm) drop.
- B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of soils and Soil-Aggregate Mixtures, using 5.5 lb. (2.49 kg) Rammer and 2-inch (304.8 mm) drop.
- C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, using 10 lb. (4.54 kg) Rammer and 18-inch (457 mm) drop.
- D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D3017 - Test Methods for Moisture Content of soil and Soil-Aggregate Mixtures.

1.06 DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.07 PROJECT DOCUMENTS

- A. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts and invert elevations, and structure top elevations.

1.08 SUBMITTALS

- A. Submit in accordance with Division 1 requirements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Concrete Pipe: Concrete pipe shall be reinforced concrete culvert pipe conforming to ASTM Designation C 76, Table III, except when otherwise indicated. Reinforced concrete horizontal elliptical pipe shall conform to the requirements of ASTM Designation C 507, Class HE III. Pipe joints shall be rubber gasket joints and the pipe joint shall be manufactured to meet the requirements of the approved type of gasket to be used. Pipe joints and rubber gaskets shall conform to the requirements of Sections 941 and 942 of the FDOT Standard Specifications.
- B. Polyvinyl-Chloride Pipe: Polyvinyl chloride pipe (PVC) shall be in accordance with Section 948 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.
- C. Corrugated Polyethylene Pipe: Corrugated Polyethylene pipe (HDPE) shall be in accordance with Section 948 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.
- D. Brick: Brick for drainage structures shall be dense, hard burned, shale or clay brick conforming to ASTM Designation C 32, Grade MM or C 62, Grade MW, except that brick absorption shall be between five and twenty-five grams of water absorbed in one minute by dried brick, flat face down, in 1/8-inch of water.
- E. Cement Mortar: Cement mortar for manhole construction shall be one-part cement and two parts clean sharp sand to which may be added lime in the amount of not over twenty-five percent volume of cement. It shall be mixed dry and then wetted to proper consistency for use. No mortars that have stood for more than one hour shall be used.
- F. Concrete: Concrete shall conform to the requirements of Section 32 13 10 Concrete and unless otherwise specified all concrete shall be Class B.
- G. Precast Concrete Units: Precast concrete inlets shall conform to applicable requirements of Section 03000 Concrete of these Specifications. Concrete for use in precast units shall be Class A.

- H. Castings: Castings for inlets and other items shall conform to the ASTM Designation A 48, Class 25. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions which would impair their strength or otherwise make them unfit for the service intended. No plugging or filling will be allowed. Casting patterns shall conform to those shown or indicated on the drawings.
- I. Plastic Filter Fabric: Plastic filter fabric shall conform to Section 985 of the FDOT Standard Specifications. Carthage Mills Filter X is an acceptable plastic filter fabric.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that trench and bedding have been prepared to receive work and that excavations and dimensions are as indicated on drawings.

3.02 PREPARATION

- A. Pipe trenches shall be of necessary widths for the proper laying of the pipe and the banks shall be as nearly vertical as practicable. In paved areas, the trench shall be vertical and sheeted, if required; the clearance between the pipe and trench wall or back of sheeting shall not exceed 18-inches. The bottom of the trenches shall be excavated to a depth of the outside bottom of the pipe barrel. Any over excavation shall be replaced with suitable compacted material. Excavation for inlets and other appurtenances shall be sufficient to provide a clearance between their outer vertical surfaces and the face of the excavation or sheeting, if used, of not less than 12 inches.
- B. Soft, spongy, or otherwise unstable material encountered below the established grade of the excavation which will not provide a firm foundation for subsequent work shall be removed and replaced as directed. Unless otherwise directed, all such unstable materials shall be removed for the full width of the excavation and replaced with approved fill materials.
- C. Where sheeting and bracing are necessary to prevent caving of the trench sidewalls or sidewalls of excavation for other structures and to safeguard the workmen, the trench or excavation for other structures shall be dug to such width that the proper allowance is made for the space occupied by the sheeting and bracing to provide clearance as specified above.

3.03 INSTALLATION

- A. All pipe shall be carefully laid true to the line and grade shown on the drawings. Any deviation from true alignment or grade which would result in a displacement from the normal position of the gasket of as much as 1/4-inch or which would produce a gap exceeding 1/2-inch between sections of pipe for more than 1/3 of the circumference or the inside of the pipe, will not be acceptable and where such occurs, the pipe shall be relayed without additional compensation. No mortar, joint compound or other filler which would tend to restrict the flexibility of the basket joint shall be applied to the gap. Pipes having defects that have not caused their rejection are to be so laid that these defects will be in the upper half of the sewer.
- B. Before installation of the pipe gasket, the gasket, and the surface of the pipe joint, including the gasket recess shall be clean and free from grit, dirt, or other foreign matter at the time the joints are made. In order to facilitate closure of the joint, application of an approved vegetable soap lubricant immediately prior to closing of the joint will be permitted.

- C. All pipes shall be laid with bells or grooves uphill. As the pipes are laid throughout the work, they must be thoroughly cleaned and protected from dirt and water. No length of pipe shall be laid until the two preceding lengths have been thoroughly embedded in place so as to prevent any movement or disturbance of the finished joint. No walking on or working over the pipes after they are laid, except as may be necessary in tamping earth and refilling, will be permitted until they are covered to a depth of 1 foot. No pipe shall be laid except in the presence of the authorized inspector. Fill placed around the pipe shall be deposited on both sides simultaneously to approximately the same elevation and uniformly compacted. Whenever the pipe laying is discontinued, as at night, the unfinished end is to be securely protected from displacement due to caving of the banks or from other injury and a suitable stopper is to be inserted therein.
- D. Fill placed around the pipe shall be deposited on both sides simultaneously to approximately the same elevation and uniformly compacted. Whenever the pipe laying is discontinued, as at night, the unfinished end is to be securely protected from displacement due to caving of the banks or from other injury and a suitable stopper is to be inserted therein.
- E. Concrete inlets or other structures shall be constructed in conformity with the drawings. Forms shall be designed and constructed so that they may be removed without injury to the concrete and shall be left in place for at least 24 hours after concrete is poured. Concrete shall be thoroughly tamped and shall be cured for at least 5 days after removal of forms. Honeycomb places shall be thoroughly cleaned, saturated with water, and pointed up with mortar. Precast inlets or other structures may be used in lieu of cast-in-place structures. Grates are to be set in place in mortar to the proper line and grade.
- F. After the pipe has been installed, approved selected material from excavation at a moisture content which will facilitate compaction shall be placed alongside the pipe in layers not exceeding 6-inches loose measure in depth. Care shall be taken to insure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted by rolling or tamping with mechanical rammers. This method of filling and compacting shall be continued until the fill is 2-inches above the pipe, then the remainder of the backfill shall be placed in lifts not exceeding 9-inches. The operation of heavy equipment shall be conducted so that no damage to the pipe will result. Backfill material 12-inches and above the top of the pipe shall be compacted to not less than 95 percent of maximum density as determined by AASHTO Designation T-180, unless in public right-of-way; in which case it should be compacted to 100% maximum density. Selected material for backfill shall not contain any stones or rock larger than 3-inches. Tests for density of compaction shall be provided at one (1) test per every 300 feet of pipe laid, for each lift, and deficiencies shall be corrected by the Contractor without additional cost to the Owner.
- G. Backfill for drainage structures shall be placed and compacted in the same manner as specified above for pipe, except the concrete shall be permitted to cure for not less than five days before the backfill is placed.

END OF SECTION 33 40 01

SECTION 33 05 13 - MANHOLES AND STRUCTURES

MANHOLES AND STRUCTURES

PART 1 GENERAL

2.01 Related Documents

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

2.02 SUMMARY

- A. Section Includes:
 - 1. Precast concrete storm manhole, catch basin and inlet structures.
- B. Related Sections:
 - 1. Section 03 00 01 – Concrete Work.
 - 2. Section 31 23 33 – Trenching and Backfilling:
 - a. Bedding and fill materials.
 - b. Protection of existing items.
 - c. Excavation, fill placement, compaction, backfilling and grading for installation of utility piping and conduit.
 - d. Measures to protect the Work of this Section.
 - 3. Section 33 40 00 – Storm Drainage Utilities: Installation of storm sewer access holes, catch basins and inlets.

2.03 REFERENCES

- A. ASTM International:
 - 1. Standard Specification for Gray Iron Castings (ASTM A-48 / A-48M-03).
 - 2. Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement (ASTM A-185-97).
 - 3. Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement (ASTM A-615 / A-615M-07).
 - 4. Standard Specification for Concrete Building Brick (ASTM C-55-06).
 - 5. Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes (ASTM C-139-05).
 - 6. Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (ASTM C-443-05a).
 - 7. Standard Specification for Grout for Masonry (ASTM C-476-02).
 - 8. Standard Specification for Precast Reinforced Concrete Manhole Sections (ASTM C-478-07).
- B. State of Florida Department of Transportation (FDOT) Latest edition of Construction and Material Specifications (FDOT CMS 2024-2025).

1. Work shall be in accordance to FDOT CMS 2024-2025 or except as herein modified by these specifications.
2. All structures shall be brought to grade by use of concrete grade rings or cast in place concrete.

2.04 Quality Assurance

- A. Regulatory Requirements (Tapping Mains):
1. Use materials as specified in this Section to tap to all existing mains.
 2. Notify the City of Palmetto at least 48 hours prior to tapping existing mains to request that an inspector witness all taps.
 3. If required, submit portion of pipe removed by the boring machine to the inspector.

PART 2 PRODUCTS

3.01 CONCRETE

- A. Provide concrete for work included in this Section as specified in Section 033000 – Concrete, but in no case provide concrete strength less than 4,000 PSI at 28 days.

3.02 REINFORCING

- A. Reinforcing Bars: Deformed type conforming to ASTM A-615 / A-615M, Grade 40; shop fabricated, of size, cross section and arrangement as indicated on the Drawings.
- B. Welded Wire Fabric: ASTM A-185, size as shown on the Drawings.

3.03 MASONRY

- A. Concrete Masonry Units: ASTM C-139.
- B. Concrete Brick: ASTM C-55, Grade N.
- C. Mortar: ASTM C-476, Type M Mortar with 2,500 PSI in 28 days consisting of one part Portland cement by volume, one quarter to one half part hydrated lime, and four parts of damp, loose sand plus water sufficient to provide a workable mixture.

3.04 PRECAST CONCRETE MANHOLES

- A. Precast Concrete Manholes: ASTM C-478, cones and sections free from fractures, large or deep cracks and surface roughness; slabs sound and free from gravel pockets. Include neoprene boots.
- B. Neoprene Boots: ASTM C-443 for sanitary sewers and ASTM C-478 for storm sewers.

3.05 CASTINGS

- A. Frame, Cover, Grating and Step Castings: ASTM A-48 / A-48M.

3.06 PLASTIC STORMWATER INLET STRUCTURES

- A. PVC surface drainage inlets shall be of the inline drain type as indicated on the drawings. The ductile iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer. The surface drainage inlets shall be as manufactured by Nyloplast, a division of Advanced Drainage System, Inc., or an approved equal.
- B. The inline drain required for this project shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the furnished configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the inline body by use of swage mechanical joint. The raw material used to manufacture the pipe stock that is used to manufacture the inline drain body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.
- C. The grates furnished for all surface drainage inlets shall be ductile iron grates for sizes (as called for on the plans) shall be specifically for each fitting so as to provide a round bottom flange that closely matches the diameter of the surface inlet. Grates for inline drains shall be capable of supporting H-20 wheel loading for traffic areas or H-10 loading for pedestrian areas. 12" and 15" square grates will be hinged to the frame using pins. Metal used in the manufacture of the casting shall conform to ASTM A536 grade 70-50-02 for ductile iron.
- D. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or other granular material meeting the requirements of class 2 material as defined in ASTM D2321. Bedding and backfill for surface drainage inlets shall be placed and compacted uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade. No brick, stone or concrete block will be required to set the grate to the final grade height. For H-20 load rated installations, a concrete ring will be poured under and around the grate and frame. The concrete slab must be designed taking into consideration local soil conditions, traffic loading, and other applicable design factors. For other installation consideration such as migration of fines, ground water, and soft foundations refer to ASTM D2321 guidelines.

PART 3 EXECUTION (SEE RELATED SECTIONS ABOVE)

END OF SECTION 33 0513

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SECTION 33 4 0 00 - STORM DRAINAGE UTILITIES

STORM DRAINAGE UTILITIES

PART 1 GENERAL

2.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.02 SUMMARY

- A. Section includes storm sewer removal and installation from building and site to existing storm system.
- B. Section 31 23 33 – Trenching and Backfilling:
 - 1. Bedding and fill materials.
 - 2. Protection for existing items.
 - 3. Excavation, fill placement, compaction, backfilling and grading.
 - 4. Measures to protect the Work of this Section.

2.03 REFERENCES

- A. ASTM International:
 - 1. Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile (ASTM C-4-00).
- B. Standard Practice for Installing Vitrified Clay Pipe Lines (ASTM C-12-00).
- C. Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe
- D. Standard Specification for Concrete Aggregates (ASTM C-33-01).
- E. Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (ASTM C-76-00).
- F. Standard Specification for Portland Cement (ASTM C-150-00).
- G. Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (ASTM C-443-98).
- H. Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings (ASTM D-3034-00).
- I. Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals (ASTM D-3212-96a).

- J. Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe (ASTM F-477-99).
- K. Standard Specification for Type PS-46 and Type PS-115 Poly(Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings (ASTM F-789-95a).
- L. Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter (ASTM F-794-99).

2.04 SUBMITTALS

- A. Submit the following in accordance with the GENERAL REQUIREMENTS:
 - 1. Product Data for pipes and fittings.

2.05 PROJECT CONDITIONS

- A. Environmental Requirements (Pipe Laying in Cold Weather):
 - 1. Do not lay pipe on frozen ground or frozen bedding material.
- B. Heat pipe as recommended by the Pipe Manufacturer.

PART 2 PRODUCTS

3.01 MATERIALS

- A. Polyvinyl Chloride (PVC) Pipe and Fittings:
 - 1. 4- through 15-inch diameter: Solid wall plastic pipe and fittings per ASTM F-789 or ASTM D-3034, SDR 35.
- B. Joints in Plastic Pipe: Elastomeric gasket seal per ASTM D-3212 and ASTM F-477.
- C. High Density Polyethylene (HDPE) Pipe and Fittings:
 - 1. 12 inch through 36 inch diameter: AASHTO M294 Type S, Type III, Class C, Category 5, Grade P34:
 - a. Perforated, corrugated pipe under Synthetic and Natural Turf Playing Systems and swales.
 - b. Solid corrugated pipe with smooth interior under pavement and lawn areas.
- D. PLASTIC STORMWATER INLETS
 - 1. General
 - a. PVC surface drainage inlets shall be of the inline drain type as indicated on the drawings. The ductile iron grates for each of these fittings are to be considered an integral part of the surface drainage inlet and shall be furnished by the same manufacturer. The surface drainage inlets shall be as manufactured by Nyloplast a division of Advanced Drainage System, Inc., or an approved equal.

2. Materials

- a. The inline drain required for this project shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the furnished configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the inline body by use of swage mechanical joint. The raw material used to manufacture the pipe stock that is used to manufacture the inline drain body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.
- b. The grates furnished for all surface drainage inlets shall be ductile iron grates for sizes 8", 10", 12", 15", or 18" (as called for on the plans) shall be specifically for each fitting so as to provide a round bottom flange that closely matches the diameter of the surface inlet.

PART 3 EXECUTION

4.01 INSTALLATION

- A. Pipe Preparation and Handling:
 1. Inspect pipe and fittings prior to lowering into trench to ensure no cracked, broken, or otherwise defective materials are being used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
- B. Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid physical damage to the pipe. Remove damaged pipe from the Site. Do not drop or dump pipe into trenches under any circumstances.
- C. Excavate bell holes at each joint to permit proper assembly and inspection of entire joint.
- D. Laying and Jointing Pipe and Fittings:
 1. Start pipe laying proceeding upgrade with spigot ends pointing in direction of flow. After a section of pipe has been lowered into the prepared trench; clean the end of the pipe to be joined, the inside of the joint, and if applicable, the rubber ring, immediately before joining the pipe. Assemble the joint following manufacturer's recommendations for type of joint used. Provide special tools and appliances required for the jointing assembly.
- E. Lay pipes uniformly to line and grade so that finished sewer will present a uniform bore. Variations from line and grade in excess of the specified tolerances will be considered sufficient cause for rejection of the Work.
- F. When pipes are to be jointed with rubber gaskets, warm the gasket or joint material sufficiently to facilitate making a proper joint.
- G. Prevent excavated or other foreign material from getting into the pipe during the laying operation. Close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints:
 1. When laying operations are not in progress.

2. At the close of the day's work.
 3. Whenever the workers are absent.
- H. Plug or close off pipes which are stubbed off for manhole construction or for connection by others with temporary plugs.
- I. Take necessary precautions to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.
- J. Make connections of non-reinforced pipe to manholes or concrete structures, so that a standard pipe joint is located not more than one foot from the outside edge of the structure.
- K. When field cutting or machining the pipe is necessary, use only tools and methods recommended by the Pipe Manufacturer and approved by the Engineer.
- L. Check pipe for alignment and grade after joint has been made. Ensure pipe bedding forms a continuous and uniform bearing and support for the pipe barrel between joints. Apply sufficient pressure in making the joint to assure the joint is "home" as defined in Pipe Manufacturer's standard installation instructions. Place sufficient pipe cover material to secure pipe from movement before next joint is installed to assure proper pipe alignment and joint makeup.
- M. Line and Grade: Do not deviate from line and grade, as established by the drawings, more than 1/2 inch for line and 1/4 inch for grade, provided that such variation does not result in a level or reverse sloping invert. Measure for grade at the pipe invert, not at the top of the pipe, because of the permissible variation in pipe wall thickness. Furnish and set the line and grade boards at maximum intervals of 25 feet. If grade boards prove impractical because of trench or other conditions, other methods of controlling line and grade may be submitted to the Engineer for approval.
- N. Dewatering: Employ such means as well pointing, ditching, pumping or bailing to prevent water from entering the trench during the laying operation and allow for proper construction of the backfill in the pipe zone. Do not lay pipe in water.
- O. Installation of Plastic Stormwater Inlets
1. The specified PVC drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or granular material meeting the requirements of class 2 material as defined in ASTM D2321. Bedding and backfill for surface drainage inlets shall be placed and compacted uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade. No brick, stone or concrete block will be required to set the grate to the final grade height.

4.02 FIELD QUALITY CONTROL

- A. Notify the Engineer or local utility owner at least 24 hours prior to tapping existing main to enable inspector to witness all taps. If required, submit portion of pipe removed by boring machine to inspector.
- B. Perform cleaning and testing of sewers following the current and applicable standards of the Authority having Jurisdiction.

4.03 CLEANING

- A. Prior to final acceptance and final manhole to manhole inspection of the sewer system by the Owner/Engineer, flush and clean all parts of the system. Remove accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the closest downstream manhole. If necessary, use mechanical rodding or bucketing equipment.
- B. Upon the Owner/Engineer's final manhole to manhole inspection of the sewer system, if foreign matter is still present in the system, re-flush and clean the sections and portions of the lines as required.
- C. Measure the infiltration using a suitable weir or other acceptable device when the water table is two feet or more above of the top of the pipe line section to be tested.
- D. When infiltration cannot be properly tested, test exfiltration by filling the line to be tested with water so that a head of at least two feet is provided above the water table and the top of the pipe at the upper end of the pipe line. Allow to stand until the pipe has reached its maximum absorption, but not less than four hours. After absorption, re-establish the head. Measure the amount of water required to maintain this water level during a two hour test period.
- E. When leakage exceeds 250 gallons per inch of diameter per mile of pipeline per day as measured by either the infiltration or exfiltration test, take corrective measures and retest.

END OF SECTION 33 4 0 00

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