

ADDENDUM NO. 1

Issue Date: October 22, 2026

Project Name: Northview Public Schools
Athletics Stadium Additions and Renovation
Grand Rapids, Michigan

IDS Project No.: 25116-5000

This Addendum is issued prior to receipt of bids in order to modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections. Bidders are to indicate receipt of this Addendum in the space provided on the Bid Form.

NEW OR REVISED DOCUMENTS ISSUED WITH THIS ADDENDUM

Project Manual Documents: Table of Contents, Substitution Request Form, Submittal Form, Hold Harmless – CAD-BIM form, 03 3053, 07 2700, 08 7100, 09 2900, 09 9100, 09 9600, 20 0529, 26 5568, 27 5119, 32 1818, 32 3130, 32 3223, 32 9200

Drawings: Cover, C2.1, C2.2, C2.3, C2.4, C2.5, C3.1, C3.2, C3.3, C3.4, C3.5, C4.1, C4.2, C4.3, C4.4, C4.5, C5.1, C5.2, C5.3, C5.4, C5.5, C6.0, L1.1, L1.2.1, L1.5, L3.5, L4.1, L4.6, LD1.01, LD1.02, LD1.03, LD1.05, LD1.07, LD1.08, LD1.18, S0.02, S1.11AB, S3.0, S4.1, A2.1AB, A3.1AB, A3.1D, A4.1, A4.2, A5.1, A5.2, A5.3, A5.4, A5.5, A5.6, A9.1, A9.2, A10.1, ES2.1, ES2.3, ES2.8, E2.1, E6.1, E7.3, E8.2

Sketches: None

PROJECT MANUAL DOCUMENTS DELETED OR REVISED BUT NOT ISSUED

Item No. 1 32 3216 (Deleted)

DRAWINGS DELETED OR REVISED BUT NOT ISSUED

Item No. 1 None

SECTION 00 0110 - TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

- 00 0101 - Project Title Page
- 00 0110 - Table of Contents
- 00 0111 - Report of Geotechnical Investigation

Refer to additional Division 00 Sections authored by the Construction Manager contained in a separate volume.

SPECIFICATIONS -- GENERAL REQUIREMENTS

DIVISION 01 -- GENERAL REQUIREMENTS

- 01 1000 - Summary
- 01 2300 - Alternates
- 01 2500 - Substitution Procedures
 - [01 2500.01 - Substitution Request Form](#)
- 01 3300 - Submittal Procedures
 - [01 3300.01 -- Submittal Form](#)
 - [01 3300.02 -- CAD/BIM File Release Form](#)
- 01 4000 - Quality Requirements
- 01 4200 - References
- 01 6000 - Product Requirements
- 01 7300 - Execution
- 01 7700 - Closeout Procedures
- 01 7823 - Operation and Maintenance Data
- 01 7839 - Project Record Documents
- 01 7900 - Demonstration and Training

SPECIFICATIONS -- FACILITY CONSTRUCTION

DIVISION 02 -- EXISTING CONDITIONS

- 02 4119 - Selective Demolition

DIVISION 03 -- CONCRETE

- 03 3000 - Cast-In-Place Concrete
- 03 3010 - Cast-In-Place Concrete
- 03 3053 - Concrete Turf Anchor
- 03 4500 - Precast Architectural Concrete

DIVISION 04 -- MASONRY

- 04 2000 - Unit Masonry

DIVISION 05 -- METALS

- 05 1200 - Structural Steel Framing
- 05 3100 - Steel Decking
- 05 4000 - Cold-Formed Metal Framing
- 05 4400 - Cold-Formed Metal Trusses
- 05 5000 - Metal Fabrications

DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

- 06 1000 - Rough Carpentry
- 06 1050 - Turf Wood Nailer
- 06 1753 - Shop-Fabricated Wood Trusses
- 06 4023 - Interior Architectural Woodwork

DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

- 07 1113 - Bituminous Dampproofing
- 07 2100 - Thermal Insulation
- [07 2600 – Sheet Vapor Retarders](#)
- [07 2700 – Fluid-Applied Membrane Air Barriers](#)
- 07 3113 - Asphalt Shingles
- 07 4213 - Formed Metal Wall Panels
- 07 4646 - Fiber-Cement Siding
- 07 6200 - Sheet Metal Flashing and Trim
- 07 9200 - Joint Sealants

DIVISION 08 -- OPENINGS

- 08 1600 - FRP-Faced Composite Doors and Frames
- 08 3113 - Access Doors and Frames
- 08 3323 - Overhead Coiling Doors
- 08 4113 - Aluminum-Framed Storefronts
- 08 3613 - Sectional Doors
- 08 7100 - Door Hardware
- 08 8000 - Glazing
- 08 9000 - Louvers

DIVISION 09 -- FINISHES

- 09 2216 - Non-Structural Steel Framing
- [09 2900 – Gypsum Board](#)
- 09 5113 - Acoustical Panel Ceilings
- 09 6513 - Resilient Base and Accessories
- 09 6723 - Resinous Flooring
- 09 9100 - Painting
- 09 9600 - High-Performance Coatings

DIVISION 10 -- SPECIALTIES

- 10 1400 - Signage
- 10 2113.17 - Phenolic-Core Toilet Compartments
- 10 2800 - Toilet, Bath and Laundry Accessories
- 10 4413 - Fire Protection Specialties

DIVISION 11 -- EQUIPMENT

- 11 6833 - Athletic Field Equipment
- 11 6834 - Football Goal Posts
- 11 6836 - Soccer and Lacrosse Goals
- 11 6838 - Baseball and Softball Equipment
- 11 6840 - Field Event Construction
- 11 6842 - Protective Netting System

DIVISION 12 -- FURNISHINGS

Not Used

DIVISION 13 -- SPECIAL CONSTRUCTION

Not Used

DIVISION 14 -- CONVEYING EQUIPMENT

Not Used

SPECIFICATIONS -- FACILITY SERVICES

DIVISION 20 -- COMMON MECHANICAL REQUIREMENTS

- 20 0500 - Common Work Results for Mechanical
- 20 0513 - Common Motor Requirements for Mechanical
- 20 0519 - Thermometers, Pressure Gauges, Meters and Accessories
- 20 0523 - Valves
- 20 0529 - Hangers and Supports for Mechanical
- [20 0548 -- Vibration Control](#)
- 20 0553 - Mechanical Identification
- 20 0700 - Mechanical Systems Insulation
- 20 1100 - Plumbing and HVAC Piping

DIVISION 21 -- FIRE SUPPRESSION

Not Used

DIVISION 22 -- PLUMBING

- 22 1119 - Plumbing Specialties
- 22 1123 - Domestic Water Pumps
- 22 3300 - Electric Domestic Water Heaters
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- 23 0593 - Testing, Adjusting, and Balancing for HVAC
- [23 0900 -- Instrumentation and Control for HVAC](#)
- 23 3100 - Metal Ducts
- 23 3300 - Air Duct Accessories
- 23 3400 - Fans
- 23 3713 - Diffusers, Registers, and Grilles
- [23 8236 -- Electric Unitary Heating Equipment](#)

DIVISION 25 -- INTEGRATED AUTOMATION

Not Used

DIVISION 26 -- ELECTRICAL

- 26 0500 - Common Work Results for Electrical
- 26 0519 - Low-Voltage Electrical Power Conductors and Cables (0-1,000V)
- 26 0526 - Grounding and Bonding for Electrical Systems
- 26 0529 - Hangers and Supports for Electrical Systems
- 26 0533 - Raceways and Boxes for Electrical Systems
- 26 0553 - Identification for Electrical Systems
- 26 0570 - Electrical Testing and Power System Studies

26 0810 – Energy Code Commissioning of Electrical Systems

- 26 0923 - Lighting Control Devices
- 26 0943 - Performance Based Networked Lighting Controls
- 26 2213 - Low-Voltage Distribution Transformers
- 26 2413 - Switchboards
- 26 2416 - Panelboards
- 26 2726 - Wiring Devices
- 26 2813 - Fuses
- 26 2816 - Enclosed Switches and Circuit Breakers
- 26 2913 - Enclosed Controllers
- ~~26 3353.11 – Static Uninterruptible Power Supply (0-10kVA)~~
- 26 4313 - Surge Protective Devices for Low Voltage Electrical Power Circuits
- 26 5119 - Led Interior Lighting
- 26 5568 - Exterior Athletic Lighting
- 26 5619 - Led Exterior Lighting

DIVISION 27 -- COMMUNICATIONS

- 27 5119 - Field Utility Boxes

DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY

- Not Used

SPECIFICATIONS -- SITE AND INFRASTRUCTURE

DIVISION 31 -- EARTHWORK

- 31 1000 - Site Clearing
- 31 1012 - Fine Grading
- 31 1018 - Soil Erosion Control
- 31 2000 - Earth Moving
- 31 2010 - Earth Moving
- 31 2015 - Earthwork - Athletics
- 31 3219 - Geotextile Fabric

DIVISION 32 -- EXTERIOR IMPROVEMENTS

- 32 1123 - Aggregate Drainage Layer
- 32 1124 - Aggregate Base Course
- 32 1217 - Hot-mix Asphalt - Track
- 32 1216 - Hot-Mix Asphalt Concrete Paving
- 32 1313 - Cement Concrete Pavements, Curbs and Gutters
- 32 1373 - Concrete Paving Joint Sealants
- 32 1415 - Pavement Markings
- 32 1724 - Track Markings
- 32 1809 - Synthetic Turf (Batting Cage)
- 32 1818 - Synthetic Turf - Blend
- 32 1822 - Infield Mix - Red Clay
- 32 1826 - All-Weather Synthetic Track Surface
- 32 1828 - Long Jump Pit Sand
- 32 1831 - Shot Put Material
- 32 1852 - Performance Shock Pad
- 32 3119 - Ornamental Fence - Aluminum

32 3130 - Chainlink Fence - Vinyl

~~32 3216 - Precast Concrete Retaining Wall~~

~~32 3223 - Concrete Segmental Retaining Wall~~

32 8400 - Underground Irrigation System

32 9119 - Topsoil

~~32 9200 - Turfs and Grasses~~

32 9223 - LawnSod

32 9300 - Plants

DIVISION 33 -- UTILITIES

33 1100 - Water Mains

33 3100 - Sanitary Sewers

33 4100 - Storm Sewers, Underdrains and Drainage Structures

33 4416 - Utility Trench Drain System

33 4600 - Subdrainage System - Sand

33 4605 - Subdrainage Systems - Peastone

33 4615 - Subdrainage Systems - Turf DRAINTILE

END OF SECTION 00 0110

SUBSTITUTION REQUEST FORM

Substitution Request Number: _____ Date Submitted: _____

IDS Project Number: _____

Project Name: _____

SPECIFIED ITEM

Specification Title: _____

Specification Section No.: _____ Specification Article / Paragraph: _____

Specified Item / Description: _____

Specified Manufacturer: _____ Specified Item / Model: _____

Reason for not providing specified item (*If after Bidding*): _____

PROPOSED SUBSTITUTION

Proposed Substitution: _____

Proposed Manufacturer: _____ Proposed Item / Model: _____

Manufacturer's Website: _____

Manufacturer's Address: _____

Years manufacturer has been in business: _____ Years item / model has been manufactured: _____

Differences between proposed Substitution and specified item: _____

Will proposed Substitution affect other parts of work? ☐ No ☐ Yes

If Yes, provide explanation: _____

Benefit of proposed Substitution (*If after Bidding*): ☐ Cost savings ☐ Time savings ☐ Other

Provide explanation of Benefit: _____

100 cesar e. chavez ave sw, ste. 300 1441 w. long lake road, ste. 200
grand rapids, mi 49503 troy, mi 48098

248-823-2100 www.ids-michigan.com

IDS Project Number: _____

Provide the following information. Check box to indicate information has been attached. **Substitution Requests without the following information will be rejected.**

☐ Product data sheets.

☐ Point-by-point, comparative data.

Provide side-by-side, itemized, comparative data of specified product and proposed Substitution comparing essential attributes specified (gages, sizes, performance requirements, finishes, etc.). Alternatively provide annotated copy of applicable Specification Section indicating differences.

Indicate if any additional information is attached:

☐ Applicable certificates and test reports. ☐ List of References where proposed product is installed.

☐ Drawings. ☐ Samples. ☐ Other Items: _____

SUBMITTED BY

The Undersigned certifies, except as otherwise indicated in Substitution Request:

- Substitution is equal or superior in all respects to specified product.
- Substitution complies with requirements in the Contract Documents, is compatible with related materials, and is appropriate for applications indicated.
- Same warranty will be provided for the Substitution as for the specified product.
- Same or equivalent maintenance service and source of replacement parts, as applicable, shall be available.
- Substitution will have no adverse effect on other trades and will not affect or delay project schedule.
- Substitution will not affect dimensions and functional clearances.
- Undersigned agrees to coordinate installation of the Substitution and any changes in the Work as necessary for installation of the Substitution.
- Costs for changes to the Work and any other costs caused by the Substitution; including, but not limited to, A/E design changes, detailing, and dimensioning, shall be paid by the undersigned.
- Undersigned waives claims for additional costs and time extensions that may subsequently become apparent after Substitution is approved.

Contractor / Company: _____

Signed By: _____ Printed Name: _____

Title: _____ Date: _____

Address: _____

Email: _____ Phone: _____

ARCHITECT'S RESPONSE

- During bidding, Architect will approve Substitution by issuing an Addendum, Substitutions not approved by addendum are rejected.
- During construction, Architect will notify Contractor in writing (see below) of decision to accept or reject a Substitution. Accepted Substitutions shall be incorporated into the Work by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments as provided for in the Conditions of the Contract.

☐ Substitution Approved - Provide submittals in accordance with Specification Section 01 3000 – Submittal Procedures, as noted by Architect in Substitution Request, and in accordance with respective section for which substitution was made.

☐ Substitution Rejected - Provide specified materials.

Signed By: _____ Printed Name: _____

Architect's Comments: _____

_____ Date: _____

SUBMITTAL FORM

Project Title ⁽¹⁾ :	
IDS Project No. ⁽³⁾ :	
Submittal Date ⁽⁴⁾ :	

From/Return To ⁽²⁾ :

Submittal No. ⁽⁵⁾ :		☐ Partial ⁽⁶⁾ ☐ Resubmittal ⁽⁷⁾
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IDS Submittal No.:	
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Project Manual Section No. ⁽⁸⁾ :		Manufacturer(s) ⁽⁹⁾ :	
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Item Description ⁽¹⁰⁾	Print ⁽¹¹⁾	Product Data	Sample	Other	☐ A	☐ M	☐ E	☐ EN	☐ S	☐ C	☐ DN	☐ FS	☐ IN	☐ TE

Contractor's/Construction Manager's Remarks and Deviations ⁽¹²⁾ :
Addendum or Bulletin: ⁽¹³⁾
Substitution: ⁽¹⁴⁾
The undersigned certifies that the above submitted items have been reviewed in detail, including materials, quantities, dimensions, specified performance criteria, installation requirements, catalog numbers and field conditions and are correct and in strict compliance with the Contract Documents, except as the undersigned has noted otherwise. Approval of items does not relieve the Contractor/Construction Manager from complying with all requirements of the Contract Documents. IDS review does not relieve the contractor from responsibility for errors or omissions in this submittal. Contractor/Construction Manager: _____ Signature _____

IDS Remarks:
IDS Construction Administration Approval:
Date: _____
ACTION CODES: 1. NO EXCEPTIONS TAKEN 2. EXCEPTIONS AS NOTED 3. REVISE AND RESUBMIT 4. REJECTED 5. ACTION NOT REQUIRED
IDS Received Stamp

INSTRUCTIONS

- A. Use this form for all submittals. Integrated Design Solutions, will furnish the Contractor/Construction Manager with forms.
- B. Organize submittals by Specification Section. Use a separate form for submittals of each Specification Section. **DO NOT SUBMIT ITEMS SPECIFIED IN DIFFERENT SPECIFICATION SECTIONS ON ONE SUBMITTAL FORM.**
- C. Fill in submittal form as follows:
- (1) Project Title and Location. (Refer to Title Page of specifications. Include Bid Package number, if applicable.)
 - (2) Contractor's/Construction Manager's name and address to whom submittal is to be returned.
 - (3) Integrated Design Solutions' project number.
 - (4) Submittal Date.
 - (5) Submittal Number: Use 1, 2, 3, etc. for easy reference of each separate submittal.
 - (6) If this is a Partial Submittal of this item, check the box and use "1.1", "1.2", etc. in the submittal number space. If this is a complete submittal, do not check box.
 - (7) If this is a resubmittal (revision to a previous submittal), check the box and use the original submittal number and number the submittal "1A", "1B", etc in the submittal number space. If this is a new submittal, do not check box.
 - (8) Indicate the Project Manual Specification Section number relating to the submittal.
 - (9) Manufacturer: Insert name of product manufacturer, (e.g., Liebert).
 - (10) Item Description: Insert a brief statement describing the submitted item in generic terms (e.g. Ceramic Mosaic Tile, etc.) with a list of all drawings or identifying numbers.
 - (11) No. of Copies: Indicate the number of copies, product data, samples, etc. of each item being submitted (e.g. prints-2, reproducible-1, etc.).
 - (12) Indicate appropriate remarks and note any deviations from the requirements of the Contract Documents, as required, and sign the certification that all submittals have been reviewed.
 - (13) Indicate if submittal information is based on an addendum or bulletin. Indicate number of issue.
 - (14) Indicate whether the submittal was approved under a separate Substitution Request.
- D. The balance of this form will be filled in by Integrated Design Solutions, and returned to the Contractor along with the submittal.

**Request for Integrated Design Solutions, LLC (IDS) from Contractor For Transfer of
Computer-Aided Drafting (CAD) or Building Information Modeling (BIM) Files on Electronic Media**

Project Administrator:	_____	Contractors:	_____
IDS Project Number:	_____	Construction Manager:	_____
Project Name:	_____		_____
Location:	_____		_____
Bid Package Number	_____	Date:	_____

IDS is requested to provide the following CAD/BIM files, as listed, for the named project, for the convenience of the contractor in preparing shop fabrication drawings:

<u>Drawing No./BIM File Discipline</u>	<u>Drawing Title</u>	<u>Issue Date of Drawing/BIM File</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Drawings were prepared on the following:

Software: _____ Operating System: _____

Check appropriate format for requested files.

DWG _____ DXF _____ IGES _____ NWD _____ RVT _____ DGN _____

TERMS AND CONDITIONS

- IDS makes no representation as to the compatibility of the CAD/BIM files with any hardware or software.
- Since the information set forth on the CAD/BIM files can be modified unintentionally or otherwise, IDS reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.
- Contractor will use figured dimensions only and will not "pull" dimensions from the CAD/BIM files.
- All information on the CAD/BIM files is considered instruments of service of IDS and shall not be used for other projects, for additions to this project, or completion of this project by others. CAD/BIM files shall remain the property of IDS, and in no case shall the transfer of these files be considered a sale.
- IDS makes no representation regarding the accuracy, completeness, or permanence of CAD/BIM files, nor for their merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated on the CAD/BIM files may not have been incorporated. In the event of a conflict between IDS' sealed contract drawings and CAD/BIM files, the sealed contract drawings shall govern. It is the Contractor's responsibility to determine if any conflict exists. The CAD/BIM files shall not be considered to be Contract Documents as defined by the General Conditions of the Contract for Construction.
- The use of CAD/BIM files prepared by IDS shall not in any way obviate the Contractor's responsibility for the proper checking and coordination of dimensions, details, member sizes and gage, and quantities of materials as required to facilitate complete and accurate construction of the project.

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grand rapids, mi 49503 troy, mi 48098

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7. The Contractor/Construction Manager shall, to the fullest extent permitted by law, indemnify, defend and hold harmless IDS and its subconsultants from all claims, damages, losses, expenses, penalties and liabilities of any kind, including attorney's fees, arising out of or resulting from the use of CAD/BIM files by the Contractor, or by third party recipients of the CAD/BIM files from the Contractor.
8. IDS believes that no licensing or copyright fees are due to others on account of the transfer of the CAD/BIM files, but to the extent any are, the Contractor will pay the appropriate fees and hold IDS harmless from such claims.
9. Any purchase order number provided by the Contractor is for the Contractor's accounting purposes only. Purchase order terms and conditions are void and are not a part of this agreement.
10. This agreement shall be governed by the laws of the State of Michigan.

3D TERMS OF USE

1. The 3D Computer Model(s), including but not limited to related calculation modeling and material, for the Project is provided by IDS as defined above to the User/Recipient as defined above (individually, a "User", or collectively, "Users") at the User's request subject to the terms and conditions stated below (the "Terms of Use"). User hereby acknowledges and agrees to the following terms and conditions.
2. The 3D Model is made available to User solely as a convenience to the User and for informational purposes only. The User is not to rely upon the 3D Computer Model and the data and/or information contained therein in preparing any of its documents for the Project. The User acknowledges that the 3D Computer Model is not a part of the Construction or Contract Documents for the Project and that IDS makes no representations or warranties, expressed or implied, regarding the 3D Computer Model, the accuracy or completeness of the 3D Computer Model or the data and/or information contained therein. It is agreed that the 3D Computer Model is generated for the purposes of assisting in the construction of the Project, the sealed construction drawings/instruments of service ultimately govern the design and the construction of the Project. The construction drawings/instruments of service trump the 3D Computer Model as the ultimate authority for the design and construction of the Project and are the Project's governing documents.
3. The User agrees that these terms apply to the 3D Model in its entirety, together with all of its component parts and data. The User acknowledges that the requirements of these Terms of Use apply to all of User's principals, employees, agents, consultants, and trade contractors, including all subcontractors.
4. The User agrees that the use of the 3D Computer Model is solely at the User's risk and that the User assumes full responsibility and liability in connection with the User's use of the 3D Computer Model and the information and/or data contained therein. The User agrees that IDS has no responsibility for any deficiencies, inaccuracies, errors and/or omissions contained in the 3D Computer Model or the data and/or information contained therein. IDS has no responsibility for any deficiencies or defects in the User's documents, work and/or services resulting from the User's use of the 3D Computer Model in lieu of the Construction and/or Contract Documents for the Project.
5. The User acknowledges and agrees a) that the use of the 3D Computer Model is not a substitute for professional judgment, b) that the use of the 3D Computer Model does not relieve the User from applying the appropriate standard of care and skill relevant to the use of the 3D Computer Model and its contents; c) that the 3D Computer Model is only to be used as a tool to assist the User in connection with the Project; d) that the User is solely responsible for verifying the accuracy of all results created with the use of the 3D Computer Model; and e) IDS is not responsible or liable for the means and methods of construction and the User's use of the 3D Computer Model shall in no way give rise to such duty or liability by IDS or its consultants.
6. IDS AND ITS CONSULTANTS SPECIFICALLY DISCLAIM ALL WARRANTIES WHETHER EXPRESSED, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, ALL WARRANTIES OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE, CONSTRUCTABILITY, NON-INFRINGEMENT, COMPATIBILITY, SECURITY OR ACCURACY. USERS' USE OF THE 3D COMPUTER MODEL IS AT ITS OWN RISK. USER ASSUMES FULL RESPONSIBILITY AND RISK OF LOSS RESULTING FROM USE OR INABILITY TO USE THE 3D COMPUTER MODEL OR ITS CONTENT AND WAIVES ANY AND ALL CLAIMS AGAINST IDS IN ANY WAY RELATED TO THE 3D COMPUTER MODEL.

7. The User further agrees that the 3D Computer Model contains information that is confidential and proprietary to IDS, and that IDS retains the ownership and all other reserved rights in the work product reflected in the 3D Computer Model that was prepared by IDS or its consultants for the Project. IDS grants the User a non-exclusive, non-transferable royalty-free license to use the 3D Computer Model for information purposes only in connection with the Project [or defined other specific task] in strict accordance with these Terms of Use. The User agrees that the 3D Computer Model will be used solely and exclusively for the Project and that it will not use the 3D Computer Model and the data and/or information contained therein, in whole or in part, for any purpose or project other than the Project. The User further agrees that the 3D Computer Model will continue to be kept confidential by the User, and that it shall not be disclosed in any manner, transferred or exchanged to any third parties by the User without the expressed, written consent of IDS.
8. Upon completion of the User's involvement with the Project or at any time upon written request of IDS, the User shall upon request promptly deliver to IDS the 3D Computer Model and any other material containing or reflecting any information or data in the 3D Computer Model (whether prepared by IDS, the User or otherwise) and will not retain copies, extracts or other reproductions, tangible or intangible, in whole or in part of the 3D Computer Model. The User's non-disclosure and non-use obligations set forth herein shall survive the return, destruction or deletion of the 3D Computer Model. If the User becomes legally compelled, by subpoena or court order to disclose the 3D Model, or any information contained therein, the User shall provide IDS with prompt notice so that a protective order or other appropriate remedy may be sought by and/or compliance with the provisions of the Terms of Use may be waived.
9. User hereby agrees that IDS shall be entitled to equitable relief, including injunction, in the event of any breach of the Terms of Use, including without limitation its obligations to maintain the confidentiality of the 3D Model, that the granting of such relief will not be opposed and that such relief shall not be the exclusive remedy for such breach. IDS's failure to insist upon strict adherence to any term of these Terms of Use shall not be considered a waiver thereof or deprive IDS of the right subsequently to insist upon strict adherence to that term or any other term of this Terms of Use.
10. The User hereby agrees, to the fullest extent permitted by law, that in no event shall IDS be liable to User for any damages or losses of any kind including, but not limited to, damages by death or bodily injury to persons, injury to property, and direct, indirect, consequential, special, or incidental damages, resulting from any error, omission, inaccuracy, deficiency or defect in or problem with, the 3D Computer Model or the data and/or information contained therein. Without limiting the foregoing, the User acknowledges that the 3D Computer Model and the data and/or information contained therein may be inaccurate and/or incomplete and that IDS will have no obligation to update or modify the 3D Computer Model or any of the data and/or information contained in it because the 3D Computer Model was prepared solely for informational purposes and is not part of the Construction or Contract Documents for the Project.
11. The User its officers, directors, shareholders, partners, agents, employees, consultants, trade contractors, subcontractors or independent contractors shall, to the fullest extent permitted by law, defend, indemnify and hold IDS and its officers, directors, shareholders, partners, principals, consultants, agents and employees harmless from and against any and all actions, damages, demands, claims, suits, losses, liability, judgments, recoveries, costs and expenses including, but not limited to, reasonable attorney's fees related in any way to the 3D Computer model and/or to any use of the 3D Computer Model or the data and/or the information contained therein by the User or any third party who receives the 3D Computer Model from the User. Such claims may include, but are not limited to, any claim which may arise due to deletions, omissions or variations of data due to mechanical or technical failure in connection with the transmission of the 3D Computer Model.
12. The User acknowledges and agrees that it is not in privity of contract with IDS as of result of these Terms of Use with respect to any claims or causes of action related to or arising out of the Project. The User further agrees to obligate any contractor, consultant or other party who uses the 3D Computer Model to be bound in writing by the terms and conditions contained herein and to provide a copy of such acceptance of the Terms of Use to IDS. Any User's use of the 3D Computer Model and the information and/or data contained therein constitutes such User's acceptance of all the terms here specified.
13. The signatory of these Terms of Use on User's behalf warrants to IDS that he/she is duly authorized to sign these Terms of Use on User's behalf and that these Terms of Use are a binding obligation assumed by the User.
14. These Terms of Use shall control and supersede all prior or simultaneous negotiations, representations and agreements, either written or oral including separate agreements between the User and IDS. Signing these Terms of Use indicates the User's agreement to the terms stated above. However in the event that these Terms of Use are not fully executed, they shall nonetheless be effective and controlling to the parties so long as IDS has provided same to the User and it has utilized the 3D Computer Model subsequent to receiving this document without registering its written objections/modifications to these terms.

IDS Project Number: _____
Page 4

AUTHORIZED ACCEPTANCE

by Integrated Design Solutions, LLC

by Contractor

Signature

Signature

Print Name and Title

Print Name and Title

Date

Date

Document1

SECTION 03 3053 - CONCRETE TURF ANCHOR

PART 1 GENERAL

1.1 SUMMARY

- A. This Section is a part of the entire set of Contract Documents and shall be coordinated with the applicable provisions of the other parts.
- B. Related Sections:
 - 1. Section 03 3010 Cast In Place Concrete.
 - 2. Section 06 1050 Turf Wood Nailer.

1.2 SCOPE

- A. The work under this section of the specifications shall consist of furnishing all labor, materials and equipment necessary to install new concrete turf anchor.

1.3 QUALITY ASSURANCE

- A. Materials and methods of construction shall comply with the following standards:
 - 1. American Society for Testing and Materials, (ASTM).
 - 2. American Concrete Institute (ACI).
- B. Maintain field records of time, date of placing, curing, and removal of forms of concrete in each portion of work.

1.4 SUBMITTALS

- A. Submit concrete mix designs. Obtain approval before placing concrete.
- B. Product data:
 - 1. Submit complete materials list of items proposed for the work. Identify materials source.
 - 2. Submit admixture, curing, compound, retarder, and accessory item product data.
 - 3. Submit materials certificates for aggregates, reinforcing, and joint filler.
- C. Submit concrete delivery tickets. Show the following:
 - 1. Batch number.
 - 2. Mix by class or sack content with maximum size aggregate.
 - 3. Admixtures.
 - 4. Air content.
 - 5. Slump.
 - 6. Time of loading.
- D. Submit concrete test reports.

1.5 PROJECT CONDITIONS

- A. Work notifications: Notify Landscape Architect at least 24 hours prior to installation of concrete.
- B. Establish and maintain required lines and grade elevations.
- C. Do not install concrete work over wet, saturated, muddy, or frozen subgrade.
- D. Do not install concrete when air temperature is below 40 degrees F. Use of calcium chloride, salt, or any other admixture to prevent concrete from freezing is prohibited.
- E. Protect adjacent work.
- F. Provide temporary barricades and warning lights as required for protection of project work and public safety.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Portland cement: ASTM C150, Type 1, natural color.
- B. Aggregate: Provide ASTM C33 normal weight aggregates, 1" maximum size, clean, uncoated crushed stone or gravel coarse aggregate free of materials which cause staining or rust spots; fine aggregate shall be clean natural sand.
- C. Water: Clean, fresh, and potable.
- D. Air-entraining admixture: ASTM C260.
- E. Water-reducing admixture: ASTM C494.

2.2 MIXES

- A. Provide ASTM C94 ready-mixed concrete. Batch mixing at site not acceptable.
 - 1. Strength: 3,500 psi minimum at 28 days.
 - 2. Slump range: 2" to 4" maximum.
- B. Provide an approved water-reducing admixture in all concrete.
- C. Provide an air-entraining admixture in all concrete. Air content 5% to 7%.
- D. Indicate water added to mix at job site on each delivery ticket. Show quantity of water added. Site water tempered mixes exceeding specified slump range will be rejected as not complying with specification requirements.

2.3 ACCESSORIES

- A. Granular base: AASHTO M43, #6 (3/8" to 3/4") uniformly graded, clean crushed stone or gravel.

- B. Forms: Wood or metal of sufficient strength to resist concrete placement pressure and to maintain horizontal and vertical alignment during concrete placement. Provide forms straight, free of defects and distortion, and height equal to full depth of concrete work.
 - 1. Provide 2" nominal thickness, surfaced plank wood forms for straight sections. Use flexible metal, 1" lumber or plywood forms to form radius bends.
 - 2. Synthetic turf anchoring curb system: Forms shall be prefabricated metal forms to produce tongue and groove joint. Automated self propelled curb-and-gutter equipment shall not be allowed.
- C. Joint filler: ASTM D1751, premolded non-extruding asphalt-impregnated fiberboard, thickness indicated.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine subgrades and installation conditions. Do not start concrete work until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Proof roll the subgrade and do all necessary rolling and compacting to obtain firm, even subgrade surface. Fill and consolidate depressed areas. Remove uncompactable materials, replace with clean fill and compact to 100% of the maximum dry density in accordance with ASTM D698 Standard Proctor Method.
- B. Remove loose material and debris from base surface before placing concrete.
- C. Install, align, and level forms. Stake and brace forms in place. Maintain following grade and alignment tolerances:
 - 1. Top of form: Maximum 1/8" in 10'-0".
 - 2. Vertical face: Maximum 1/4" in 10'-0".
- D. Coat form surfaces in contact with concrete with form release agent. Clean forms after each use and coat with form release agent as necessary to assure separation from concrete without damage.

3.3 INSTALLATION

- A. Concrete placement:
 - 1. Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as specified.
 - 2. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing. In cold weather comply with ACI 306, "Recommended Practice for Cold Weather Concreting". In hot weather comply with ACI 305, "Recommended Practice for Hot Weather Concreting".
 - 3. Moisten base to provide a uniform dampened condition at the time concrete is placed. Verify manholes or other structures are at required finish elevation and alignment before placing concrete.
 - 4. Place and spread concrete to the full depth of the forms. Use only square-end shovels or concrete rakes for hand-spreading and consolidating concrete. Exercise care during spreading and consolidating operations to prevent segregation of aggregate and dislocation of reinforcement.
 - 5. Place concrete in a continuous operation between expansion joints. Provide expansion joints when sections cannot be placed continuously.
 - 6. Place concrete in one course, monolithic construction, for the full width and depth of concrete work.
 - 7. Provide curb profiles indicated.

- B. Joints:
 - 1. Construct control, expansion, and construction joints properly aligned with face perpendicular to concrete surface.
 - 2. Tooled control joints, sectioning concrete into areas indicated. Tool joints to depth equal to not less than 1/2" depth.
 - 3. Sawcut control joints every 10' LF. Sawcut depth shall be no more 3/4" deep and 1/8" in width.
 - 4. Provide expansion joints using premolded joint filler at concrete work abutting curbs, walls, structures, walks, and other fixed objects.
 - a. Protect the top edge of the joint filler during concrete placement.
 - b. 1/2" width expansion joints every 100 LF.
- C. Concrete finishing:
 - 1. Perform concrete finishing using mechanical or hand methods as required.
 - 2. Upon completion of floating, and after bleed water has disappeared and concrete can sustain foot pressure with nominal indentation, cut concrete away from forms. Work edges with an edging tool. Round edges to 1/2" radius.
 - 3. Install control joints at indicated locations during edging operations.
- D. Curing:
 - 1. Cure concrete with a non-staining liquid membrane-forming compound. Spray apply in accordance with manufacturer's recommended coverage rate. Apply curing compound immediately after completing surface finish.

3.4 FIELD QUALITY CONTROL

- A. Provide field quality control testing and inspection during concrete operations.
- B. Contractor shall provide adequate notice, cooperate with, provide access to the work, obtain samples, and assist test agency and their representatives in execution of their function.
- C. Testing:
 - 1. Provide slump test on first load of concrete delivered each day and whenever requested due to changes in consistency or appearance of concrete.
 - 2. Provide air indicator tests and air meter tests for all air-entrained concrete.
 - a. Perform air indicator test with a "Chase" AE 35 or equal air indicator, and air meter test in accordance with ASTM C231 or C173. Test first load of concrete delivered each day.
 - b. Furnish copies of field records and tests reports as listed for strength tests.
 - 3. Strength testing:
 - a. Provide 1 set of 3 test specimens for each 50 CY placed in any one day. Secure samples in accordance with ASTM C172 and mold specimens in accordance with ASTM C31.
 - b. Test 1 specimen at 7 days and 2 specimens at 28 days in accordance with ASTM C39.
 - c. Furnish copies of field records and test reports as follows:
 - 1) 1 copy to Contractor.
 - 2) 1 copy to Ready Mix Supplier.
 - 4. Record the exact location of the concrete in the work represented by each set of cylinders and show on test reports.
 - 5. Provide an insulated moist box for protection of the test cylinders until shipped to the laboratory.

3.5 PROTECTION

- A. Protect concrete work from damage due to construction and vehicular traffic until final acceptance. Exclude construction and vehicular traffic from concrete pavements for at least 14 days.

3.6 CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from concrete operations.
- B. Sweep concrete sidewalks and pavement, wash free of stains, discoloration, dirt, and other foreign material immediately prior to final acceptance.

END OF SECTION 03 3053

SECTION 07 2700 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Weather/water-resistant barrier (WRB) as follows:
 - 1. Vapor-permeable, fluid-applied air barriers.

1.2 DEFINITIONS

- A. ABAA: Air Barrier Association of America.
- B. Air Barrier: Weather-resistant barrier made of material that is relatively air impermeable, to the degree specified
- C. Vapor Permeable Air Barrier: Airtight barrier made of material that is water vapor permeable (breathable) to the degree specified.
- D. Vapor Retarder (Barrier) Air Barrier: Airtight barrier made of material that is water vapor impermeable to the degree specified. Often referred to as a vapor barrier.
 - 1. Classes: Defined as follows per Michigan Building Code, Table 1404.3(1):
 - a. Class 1: Perm rating of less than or equal to 0.1; ASTM E96/E96M , Method B.
 - b. Class 2: Perm rating greater than 0.1 and less than or equal to 1.0; ASTM E96/E96M, Method B.
 - c. Class 3: Perm rating greater than 1.0 and less than or equal to 10.0; ASTM E96/E96M, Method B.
- E. Water Vapor Permeance: $57.2 \text{ ng/Pa s m}^2 = 1 \text{ perm}$.
- F. Weather-resistant Barrier (WRB): Barriers that prevent air, water vapor, and water from infiltrating into the building's interior, to the degree specified.

1.3 REFERENCE STANDARDS

- A. ABAA T0002 - Standard Test Method for Pull-off Strength of Adhered Air and Water Resistive Barriers Using an Adhesion Tester.
- B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- F. ASTM D4263 - Standard Practice for Indicating Moisture in Concrete by the Plastic Sheet Method.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
- I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

- J. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.
- K. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.
- L. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies.
- M. ASTM E3158 - Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building.
- N. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials.
- O. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing.
- P. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Construction Manager, testing and inspecting agency representative, air barrier assembly Installer, air barrier assembly manufacturer's representative, substrate Installer, roof assembly Installer, and installers whose work interfaces with or affects air barrier assembly, including installers of windows, doors, storefront, and curtain wall.
 - 2. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barrier assembly. Including, but not limited to, the following:
 - a. Sequence of construction.
 - b. Coordination with substrate preparation.
 - c. Air barrier materials approved for use.
 - d. Compatibility of materials.
 - e. Coordination with installation of adjacent and covering materials.
 - f. Details of construction, including, but not limited to:
 - 1) Penetrations.
 - 2) Openings.
 - 3) Transitions.
 - 4) Terminations.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; temperature and other limitations of installation conditions; technical data; dry film thickness; and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
 - 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 3. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.

1. For Manufacturer: Include documentation that manufacturer is an Air Barrier Association of America (ABAA) Evaluated Manufacturer.
2. For Installer: Include documentation of Installer accreditation and employee certifications under the Air Barrier Association of America's (ABAA) Quality Assurance Program (QAP).
 - a. Include Installer's accreditation number and certification numbers of the Installer's employees.
- B. Qualification Data: For testing agency.
- C. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with one another and with Project materials that connect to or that come in contact with air barrier assembly.
 1. Include documentation that air-barrier assembly is an Air Barrier Association of America (ABAA) Evaluated Assembly.
- D. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- E. Field quality-control reports.
- F. Sample Warranties: For special manufacturer's warranty and special installer's warranty.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than 5 years of documented experience.
 1. Manufacturer shall be an Air Barrier Association of America (ABAA) Evaluated Manufacturer.
- B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum 5 years of documented experience and as follows:
 1. Installer shall be approved or certified by the air barrier manufacturer.
 2. Installer shall be accredited under the Air Barrier Association of America's (ABAA) Quality Assurance Program (QAP) and employ ABAA-certified installers.
 - a. Accreditation and certifications shall be current at the time of bidding and maintained throughout the complete installation period.
- C. Testing Agency Qualifications:
 1. Laboratory accredited by International Accreditation Service Inc. (IAS) or American Association for Laboratory Accreditation (A2LA).

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with material Manufacturer's name, product, date of manufacture, and directions for storage
- B. Store materials in original undamaged packages in clean, dry, protected location and within temperature range required by material manufacturer. Protect stored materials from direct sunlight and other sources of ultra-violet light.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
 1. Protect substrates from environmental conditions that affect air-barrier performance.
 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

- B. Ultra-violet exposure. Do not expose air barrier materials to sunlight longer than as recommended by the material manufacturer.

1.10 WARRANTY

- A. Special Manufacturer's Warranty: Provide manufacturer's standard product warranty, for a minimum three years from date of Substantial Completion.
- B. Special Installer's Warranty: Provide a two year installation warranty from date of Substantial Completion, including all accessories and materials of the air barrier assembly, against failures including, but not limited to, loss of air tight seal, loss of watertight seal, loss of attachment, loss of adhesion and failure to cure properly.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain components of air-barrier assembly from a primary air-barrier material manufacturer or manufacturers approved by primary air-barrier material manufacturer. Provide from a single source.

2.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Assembly Performance - General:
 - 1. Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration.
 - 2. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
 - 3. Air barrier assembly shall accommodate movements of building materials by providing expansion and control joints as required.
 - a. Expansion and control joints, changes in substrate, and perimeter conditions shall have appropriate accessory materials at such locations.
 - 4. Air barrier assembly shall be capable of withstanding combined design wind, fan and stack pressures, both positive and negative, on the envelope without damage or displacement, and shall transfer the load to the structure.
 - 5. Fluid applied air barriers shall not displace adjacent materials in the air barrier assembly under full load.
 - 6. Air barrier assembly shall be joined in an airtight and flexible manner to the air barrier materials of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement.
 - 7. Connections to Adjacent Materials: Provide connections to prevent air leakage at adjacent materials, including, but not limited to, the following locations:
 - a. Foundation and walls, including penetrations, ties and anchors.
 - b. Walls, windows, curtain walls, storefronts, louvers and doors.
 - c. Different assemblies and fixed openings within those assemblies.
 - d. Wall and roof connections.
 - e. Floors over unconditioned space.
 - f. Walls, floor, and roof across construction, control and expansion joints.
 - g. Walls, floors and roof to utility, pipe, and duct penetrations.
 - h. Seismic and expansion joints.
 - i. All other potential air leakage pathways in the building envelope.

- B. Air-barrier assembly shall be an Air Barrier Association of America (ABAA) Evaluated Assembly.
- C. Air-barrier assembly shall comply with ICC-ES AC212 and ICC-ES AC148.
- D. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E2357.

2.3 AIR BARRIER MATERIALS - VAPOR PERMEABLE AIR BARRIER

- A. Vapor Permeable Air Barrier Membrane, Fluid-Applied:
 - 1. Physical and Performance Properties:
 - a. Dry Film Thickness: As recommended by weather barrier manufacturer; 30 mils, minimum.
 - b. Water Penetration: No water penetration at 6.24 psf per ASTM E331.
 - c. Water Vapor Permeance: 10 perms, minimum; ASTM E96/E96M, Method B.
 - d. Air Permeance: 0.004 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft.; ASTM E2178.
 - e. Elongation: 250 percent, minimum; ASTM D412.
 - f. Tensile Strength: 100 psi, minimum; ASTM D412.
 - g. Flame Spread Index: Less than 25, Class A; ASTM E84.
 - h. Smoke Developed Index: Less than 450, Class A; ASTM E84.
 - i. Nail Sealability: Pass, no leakage; ASTM D1970/D1970M.
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing; Fire Resist Barritech VP: www.carlisleccw.com.
 - b. GCP Saint-Gobain; Perm-a-Barrier VPL: www.gcpat.com.
 - c. Henry, a Carlisle Company; Air-Bloc 17MR: www.henry.com
 - d. Pecora; XL-Perm Ultra VP: www.pecora.com.
 - e. Polyglass U.S.A., Inc.; VertiWrap VPL: www.polyglass.us.
 - f. Prosoco Inc.; R-Guard Spray Wrap MVP: www.prosoco.com.
 - g. Soprema; Sopraseal LM 202 VP: www.soprema.us.
 - h. Tremco Inc.; EXOAIR 230: www.tremcosealants.com.
 - i. W.R. Meadows; Air-Shield LMP: www.wrmeadows.com.

2.4 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.
- C. Transitions and Flashings:
 - 1. General:
 - a. Products shall be compatible with air barrier and approved by the air barrier manufacturer.
 - b. Maintain the continuity of the air and water barrier as it transitions to adjacent materials.
 - c. Materials shall be compatible with adjacent materials.
 - 2. Liquid-Applied Flashings and Sealants:
 - a. Non-asphaltic product: one part, fast curing, non-sag, elastomeric, gun grade, trowelable liquid flashing.
 - b. Products: Subject to compliance with requirements, available products include, but are not limited to, the following:

- 1) The Dow Chemical Company; Dowsil 758 Silicone Weather Barrier Sealant: www.dow.com.
 - 2) Momentive Performance Materials, Inc./GE; Elemax 5000 Liquid Flashing: www.siliconeforbuilding.com.
 - 3) Prosoco Inc.; R-Guard FastFlash: www.prosoco.com.
 - 4) Tremco, Inc.; Spectrem 1: www.tremcosealants.com.
 3. Silicone Sheet Transitions:
 - a. Pre-cured silicone rubber sheets and pre-molded corners.
 - b. Install using liquid-applied flashings and sealants as an adhesive.
 - c. Products: Subject to compliance with requirements, available products include, but are not limited to, the following:
 - 1) The Dow Chemical Company; Dowsil Silicone Transition Strip: www.dow.com.
 - 2) Momentive Performance Materials, Inc./GE; UltraSpan UST/USM Pre-Cured Silicone Transition Sheet and Molded Corners: www.siliconeforbuilding.com.
 - 3) Prosoco Inc.; R-Guard SureSpan EX: www.prosoco.com.
 - 4) Tremco, Inc.; ProGlaze ETA and Spectrem Simple Seal: www.tremcosealants.com.
 4. Flexible Fabric Flashing - Self-Adhering: Self-adhering stainless steel/polymer fabric flashing. ASTM A240/A240M stainless steel sheet bonded with rubber-based adhesive to one sheet of polymer fabric. Flashing shall be self-adhering using a pressure-sensitive adhesive.
 - a. Type 304 stainless steel.
 - 1) Thickness: 2 mils, minimum.
 - b. Products: Subject to compliance with requirements, available products include, but are not limited to, the following:
 - 1) York Manufacturing, Inc.; York 304: www.yorkmfg.com.
 - 2) Momentive Performance Materials, Inc./GE; GE Elemax SS Flashing: www.siliconeforbuilding.com.
 5. Flexible Fabric Flashing: Stainless steel/polymer fabric flashing. ASTM A240/A240M stainless steel sheet bonded with rubber-based adhesive to one sheet of polymer fabric.
 - a. Type 304 stainless steel.
 - 1) Thickness: 2 mils, minimum.
 - b. Products: Subject to compliance with requirements, available products include, but are not limited to, the following:
 - 1) York Manufacturing, Inc.; Multi-Flash SS: www.yorkmfg.com:
 - 2) Prosoco Inc.; R-Guard SS ThruWall: www.prosoco.com.
 6. Metal Flashings:
 - a. Stainless-steel sheet: ASTM A666/A666M or ASTM A240/A240M, Type 304, 0.025 inch thick, minimum; smooth 2D (dull cold-rolled) finish.
 - 1) Fasteners: Stainless steel.
 - b. Comply with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.
- D. Sealants: Provide non-sag sealants compatible with air barrier and approved by the air barrier manufacturer.
- E. Miscellaneous Accessories:
 1. As recommended by air barrier manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that substrates to be smooth without large voids or sharp protrusions.
 - 3. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
 - 4. Verify that substrates are visibly dry and free of moisture.
 - a. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D4263.
 - 5. Verify that masonry joints are cut flush and completely filled with mortar.
 - 6. Verify that penetrating work by other trades is in place and complete.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Clean metal surfaces to remove release agents or other non-compatible coatings using clean sponges or material chemically compatible with the air barrier materials.
- D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete. Use cleaning agents that are chemically compatible with the air barrier materials.
- E. Remove fins, ridges, mortar, and other projections. Fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material compatible with the air barrier materials.
- F. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- G. Prepare static gaps and joints as recommended by ABAA, air barrier manufacturer, and as indicated on Drawings.
- H. Coordinate with isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joint transitions; detail as recommended by ABAA, air barrier manufacturer, and as indicated on Drawings.
- I. Install transitions and flashings around corners of openings, around penetrations, and elsewhere as recommended by ABAA, air barrier manufacturer, and as indicated on Drawings.
 - 1. Use silicone sheet transitions and pre-molded corners adhered with liquid-applied flashings and sealants except where flexible fabric flashings or metal flashings are indicated on Drawings or recommended by air barrier manufacturer.
 - 2. Prime substrates for installation of transition and flashing materials if recommended by material manufacturer.
- J. Coordinate detailing of transitions to other materials in order to maintain a continuous air and water barrier.
 - 1. Ensure that transition materials are compatible with adjacent materials and substrates.

3.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to ABAA, air-barrier manufacturer's written instructions, and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
- B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- C. Ensure that all transitions, bridging of gaps and joints, corners, flashings, penetrations, and terminations are completed in accordance with the recommendations of ABAA, the air barrier manufacturer, and as indicated on Drawings
- D. Repair punctures, voids, and deficient lapped seams. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. Air Barriers: Apply continuous unbroken air-barrier material to substrates according to ABAA, the air barrier manufacturer's written instructions, and Drawing details.
 - 1. Apply air-barrier material in full contact around protrusions such as masonry ties.
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Verification of substrate preparations. Do not cover until inspections are complete
 - a. Includes, but is not limited to, the following:
 - 1) Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 - 2) Continuous structural support of air-barrier system has been provided.
 - 3) Surfaces have been primed, if applicable.
 - 2. Verification that transitions and flashing details are installed properly. Do not cover until inspections are complete.
 - a. Laps in transition membranes shall comply with minimum requirements and be shingled in the correct direction, or mastic has been applied on exposed edges, with no fishmouths.
 - b. Transition membranes are firmly adhered to substrate.
 - 3. Site conditions for application temperature and dryness of substrates have been maintained.

4. Maximum exposure time of materials to UV deterioration has not been exceeded.
 5. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 6. Compatible materials have been used.
 7. All penetrations have been sealed.
- C. Tests: Provide the following:
1. Membrane Adhesion Test:
 - a. Test materials for a minimum air-barrier adhesion of 16 lbf/sq. in. or to manufacturer's minimum adhesion level per substrates, whichever is greater, in accordance with ABAA T0002.
 - b. Perform test after curing period recommended by the manufacturer.
 - c. Record mode of failure and area which failed in accordance with test standard.
 - d. Test Locations: Once daily per substrate during installation and a minimum of 3 tests per major elevation per substrate.
 - e. Provide inspection report.
 2. Dry Film Thickness Test:
 - a. Test material in accordance with manufacturer's requirements to confirm that cured membrane meets manufacturer's indicated dry film thickness requirements.
 - b. Three 1 inch by 4 inch samples removed from separate areas; at gypsum substrates, remove with gypsum facer intact to avoid stretching membrane.
 - c. Test Locations:
 - 1) 6 tests distributed uniformly across elevations.
 - d. Failure Criteria:
 - 1) A measurement less than manufacturer's required dry film thickness is considered a failure.
 - e. Provide inspection report indicating results and include photo documentation.
 3. Air-Leakage Testing – Whole Building:
 - a. Air-barrier assemblies will be tested using whole-building pressurization for evidence of air leakage according to ASTM E779 or ASTM E3158, local building codes and Authorities Having Jurisdiction (AHJ).
 - b. Air leakage shall not exceed 0.40 cfm/sf under pressure differential of 0.3 inches of water, where the air leakage rate is normalized by the sum of the above-grade and below-grade building envelope areas of the conditioned space and semiheated space.
 - c. Provide an inspection report that indicates results including photo documentation.
- D. Air barriers will be considered defective if they do not pass tests and inspections.
1. Contractor shall correct failures at no additional cost to Owner.
 2. Upon failure of Adhesion Testing:
 - a. Determine cause of failure.
 - b. Provide one additional test for each occurrence of failure.
 - c. Repair deficient air barrier components per manufacturer's recommendations.
 - d. Repair tested areas per manufacturer's recommendations.
 3. Upon failure of Dry Film Testing:
 - a. Determine cause of failure.
 - b. Provide one additional test for each occurrence of failure.
 - c. Repair deficient air barrier components per manufacturer's recommendations.
 - d. Repair tested areas per manufacturer's recommendations.
- E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Upon failure of Air Leakage Testing:
 - a. Determine cause of failure.
 - b. Repair per manufacturer's recommendations and retest deficient air barrier components.
 - c. Determine if deficient conditions are present elsewhere on the building and repair per manufacturer's recommendations.
 - d. Provide additional tests until air leakage testing complies with requirements.
- F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- G. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 1. Where applicable, protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 07 2700

SECTION 08 7100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Mechanical and electrified door hardware.
 - 2. Electronic access control system components.
- B. Section excludes:
 - 1. Windows
 - 2. Cabinets (casework), including locks in cabinets
 - 3. Signage
 - 4. Toilet accessories
 - 5. Overhead doors
- C. Related Sections:
 - 1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
 - 2. Division 06 Section "Rough Carpentry"
 - 3. Division 06 Section "Finish Carpentry"
 - 4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
 - 5. Division 08 Sections:
 - a. "Aluminum-Framed Entrances and Storefronts"
 - 6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
 - 7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.2 REFERENCES

- A. UL, LLC
 - 1. UL 10B - Fire Test of Door Assemblies
 - 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
 - 3. UL 1784 - Air Leakage Tests of Door Assemblies
 - 4. UL 305 - Panic Hardware
- B. DHI - Door and Hardware Institute
 - 1. Sequence and Format for the Hardware Schedule
 - 2. Recommended Locations for Builders Hardware
 - 3. Keying Systems and Nomenclature
 - 4. Installation Guide for Doors and Hardware
- C. NFPA – National Fire Protection Association
 - 1. NFPA 70 – National Electric Code
 - 2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
 - 3. NFPA 101 – Life Safety Code
 - 4. NFPA 105 – Smoke and Draft Control Door Assemblies
 - 5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.3 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
 - a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
 - b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
 - c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
 - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
 - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
 - c. Indicate complete designations of each item required for each opening, include:
 - 1) Door Index: door number, heading number, and Architect's hardware set number.
 - 2) Quantity, type, style, function, size, and finish of each hardware item.

- 3) Name and manufacturer of each item.
- 4) Fastenings and other pertinent information.
- 5) Location of each hardware set cross-referenced to indications on Drawings.
- 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
- 7) Mounting locations for hardware.
- 8) Door and frame sizes and materials.
- 9) Degree of door swing and handing.
- 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:

- a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
- b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
- c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
- d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
- e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
- f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Final approved hardware schedule edited to reflect conditions as installed.
 - d. Final keying schedule
 - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
 - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
 - a. fire door assemblies, in compliance with NFPA 80.
 - b. required egress door assemblies, in compliance with NFPA 101.

1.4 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
 - a. For door hardware: DHI certified AHC or DHC.
 - b. Can provide installation and technical data to Architect and other related subcontractors.
 - c. Can inspect and verify components are in working order upon completion of installation.
 - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
 - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
 - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
2. Smoke and Draft Control Door Assemblies:
 - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
 - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware
 - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
4. Accessibility Requirements:
 - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

- a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2) Preliminary key system schematic diagram.
 - 3) Requirements for key control system.
 - 4) Requirements for access control.
 - 5) Address for delivery of keys.

2. Pre-installation Conference

- a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- b. Inspect and discuss preparatory work performed by other trades.
- c. Inspect and discuss electrical roughing-in for electrified door hardware.
- d. Review sequence of operation for each type of electrified door hardware.
- e. Review required testing, inspecting, and certifying procedures.
- f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:

- a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

- D. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- E. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- F. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- G. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- H. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- I. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.5 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.6 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
 - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
 - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
 - a. Mechanical Warranty
 - 1) Locks
 - a) Schlage L Series: 10 years
 - 2) Exit Devices
 - a) Von Duprin: 10 years
 - 3) Closers
 - a) LCN 4000 Series: 30 years
 - b. Electrical Warranty
 - 1) Exit Devices
 - a) Von Duprin: 3 years

1.7 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
 - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.

- B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance in section 01 25 00.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

- A. Fabrication
 - 1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
 - 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 - 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- C. Cable and Connectors:
 - 1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
 - 2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
 - 3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.3 CONTINUOUS HINGES

- A. Manufacturers:
 - 1. Scheduled Manufacturer:
 - a. Ives
 - 2. Acceptable Manufacturers:
 - a. Select
- B. Requirements:
 - 1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
 - 2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
 - 3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.

4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.4 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
 - a. Von Duprin EPT-10
2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.5 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Trimco
 - b. Rockwood

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.6 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage L9000 series

2. Acceptable Manufacturers and Products:

- a. No Substitute

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-3/5-inch x 3/5 inch with 180-degree visibility. Provide messages color-coded using ANSI Z535 Safety Red with full text and/or symbols, as scheduled, for easy visibility. When applicable allows for lock status indication on both sides of the door.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 - a. Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.
 - b. Lever Design: 17A.

2.7 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Von Duprin 98/35A series
2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.

11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.8 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Von Duprin 6000 series
2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary resistant that are tested to a minimum endurance test of 1,000,000 cycles.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.9 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
 - a. Schlage
2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide FSIC cylinders/housing less core to accept FSIC final cores provided by Owner, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide the following keyway: Final cores provided by Owner.
 - a. Temporary construction cores provided by Owner.
 - b. Owner or Owner's Representative will replace temporary construction cores with final cores.

2.10 KEYING

- A. Final cores provided by Owner.

2.11 DOOR CLOSERS

- A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. LCN 4010/4110 series
2. Acceptable Manufacturers and Products:
 - a. No Substitute

- B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.12 DOOR TRIM

- A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Trimco
 - b. Rockwood

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.13 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
 - a. Glynn-Johnson
2. Acceptable Manufacturers:
 - a. No Substitute

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.14 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Zero International
2. Acceptable Manufacturers:
 - a. National Guard
 - b. Reese

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.15 FINISHES

- A. Finish: Generally, satin chromium BHMA 626/652 (US26D). Provide finish for each item as indicated in sets.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.
- B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
 - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
 - 1. Install construction cores to secure building and areas during construction period.
 - 2. Replace construction cores with permanent cores as indicated in keying section.

- J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
 - 1. Conduit, junction boxes and wire pulls.
 - 2. Connections to and from power supplies to electrified hardware.
 - 3. Connections to fire/smoke alarm system and smoke evacuation system.
 - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 - 5. Connections to panel interface modules, controllers, and gateways.
 - 6. Testing and labeling wires with Architect's opening number.
- K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.
- M. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- N. Overhead Stops/Holders: Mount overhead stopes/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- T. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.3 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.4 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.

- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.5 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to 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.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

Hardware Group No. 01

For use on Door #(s):

102 104

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STOREROOM W/DEADBOLT	L9480J LLL 17A 09-544 L283-150	626	SCH
		- LESS OUTSIDE LEVER			
1	EA	FSIC CONST CORE	PROVIDED BY OWNER	626	SCH
1	EA	FSIC PERMANENT CORE	PROVIDED BY OWNER	626	SCH
1	EA	ELECTRIC STRIKE	6216 FSE CON	✓ 630	VON
1	EA	OUTSIDE INDICATOR, CYLINDER KIT	47804352	626	SCH
1	EA	INTERIOR INDICATOR, ADA THUMBTURN KIT	47804357	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	BLADE STOP SPACER	4110-61	689	LCN
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	566A	A	ZER
1	EA	WIRE HARNESS	CON-192P	✓	SCH
		- WIRE EXTENSION FROM ELECTRIC STRIKE TO POWER SUPPLY			
1	EA	CARD READER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	DOOR CONTACT	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	MOTION SCANNER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	POWER SUPPLY	PROVIDED BY SECURITY CONTRACTOR	✓	

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
		WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

NOTES:

- 1) RELATED TRADES TO REFER TO WIRING DIAGRAM TO ACCOUNT FOR CONDUCTOR COUNTS, WIRE GAUGE, AND ROUGH-IN LOCATIONS.
- 2) COORDINATE MOUNTING OF OFFSET PULL WITH OUTSIDE INDICATOR KIT PRIOR TO FINAL INSTALLATION.

OPERATIONAL DESCRIPTION: COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

UNLOCKED HOURS: DOOR ELECTRONICALLY UNLOCKED VIA ACCESS CONTROL SYSTEM, THUS IN PUSH/PULL MODE.

TURNING INSIDE DEADBOLT CHANGES OUTSIDE INDICATOR TO "OCCUPIED" AND INSIDE INDICATOR TO "LOCKED" AND PREVENTS ENTRY. TURNING INSIDE DEADBOLT TO UNLOCKED POSITION OR DEPRESSING INSIDE LEVER CHANGES OUTSIDE INDICATOR TO "VACANT" AND INSIDE INDICATOR TO "UNLOCKED" AND ALLOWS ENTRY.

LOCKED HOURS: DOOR NORMALLY CLOSED AND LOCKED VIA ACCESS CONTROL SYSTEM. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY UNLOCK THE ELECTRIC STRIKE ALLOWING ACCESS.

TURNING INSIDE DEADBOLT CHANGES OUTSIDE INDICATOR TO "OCCUPIED" AND INSIDE INDICATOR TO "LOCKED" AND PREVENTS ENTRY BY CARD READER. TURNING INSIDE DEADBOLT TO UNLOCKED POSITION OR DEPRESSING INSIDE LEVER CHANGES OUTSIDE INDICATOR TO "VACANT" AND INSIDE INDICATOR TO "UNLOCKED" AND ALLOWS ENTRY BY CARD READER.

THE MOTION SENSOR TO SHUNT THE ALARM OUTPUT OF THE DOOR CONTACT DURING VALID EGRESS. DOOR CONTACT MONITORS WHETHER THE DOOR IS OPENED, CLOSED OR HELD OPEN TOO LONG. DOOR TO REMAIN LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 02

For use on Door #(s):

105 107B 107D 108B 108C S108
S109

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STOREROOM LOCK	L9080J LLL 17A L283-150 - LESS OUTSIDE LEVER	626	SCH
1	EA	FSIC CONST CORE	PROVIDED BY OWNER	626	SCH
1	EA	FSIC PERMANENT CORE	PROVIDED BY OWNER	626	SCH
1	EA	ELECTRIC STRIKE	6211AL FSE CON	✓ 630	VON
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	BLADE STOP SPACER	4110-61	689	LCN
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	566A	A	ZER
1	EA	WIRE HARNESS	CON-192P - WIRE EXTENSION FROM ELECTRIC STRIKE TO POWER SUPPLY	✓	SCH
1	EA	CARD READER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	DOOR CONTACT	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	MOTION SCANNER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	POWER SUPPLY	PROVIDED BY SECURITY CONTRACTOR WEATHERSTRIP BY DOOR/FRAME MANUFACTURER	✓	

NOTES:

1) RELATED TRADES TO REFER TO WIRING DIAGRAM TO ACCOUNT FOR CONDUCTOR COUNTS, WIRE GAUGE, AND ROUGH-IN LOCATIONS.

OPERATIONAL DESCRIPTION: COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

DOOR NORMALLY CLOSED AND LOCKED VIA ACCESS CONTROL SYSTEM. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY UNLOCK THE ELECTRIC STRIKE ALLOWING ACCESS. THE MOTION SENSOR TO SHUNT THE ALARM OUTPUT OF THE DOOR CONTACT DURING VALID EGRESS. DOOR CONTACT MONITORS WHETHER THE DOOR IS OPENED, CLOSED OR HELD OPEN TOO LONG. DOOR TO REMAIN LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 03

For use on Door #(s):

106

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	STOREROOM LOCK	L9080J LLL 17A L283-150 - LESS OUTSIDE LEVER	626	SCH
1	EA	FSIC CONST CORE	PROVIDED BY OWNER	626	SCH
1	EA	FSIC PERMANENT CORE	PROVIDED BY OWNER	626	SCH
1	EA	ELECTRIC STRIKE	6211AL FSE CON	✓ 630	VON
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	OH STOP & HOLDER	100H	630	GLY
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	BLADE STOP SPACER	4110-61	689	LCN
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	566A	A	ZER
1	EA	WIRE HARNESS	CON-192P - WIRE EXTENSION FROM ELECTRIC STRIKE TO POWER SUPPLY	✓	SCH
1	EA	CARD READER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	DOOR CONTACT	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	MOTION SCANNER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	POWER SUPPLY	PROVIDED BY SECURITY CONTRACTOR WEATHERSTRIP BY DOOR/FRAME MANUFACTURER	✓	

NOTES:

1) RELATED TRADES TO REFER TO WIRING DIAGRAM TO ACCOUNT FOR CONDUCTOR COUNTS, WIRE GAUGE, AND ROUGH-IN LOCATIONS.

OPERATIONAL DESCRIPTION: COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

UNLOCKED HOURS: DOOR ELECTRONICALLY UNLOCKED VIA ACCESS CONTROL SYSTEM, THUS IN PUSH/PULL MODE.

LOCKED HOURS: DOOR NORMALLY CLOSED AND LOCKED VIA ACCESS CONTROL SYSTEM. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY UNLOCK THE ELECTRIC STRIKE ALLOWING ACCESS.

THE MOTION SENSOR TO SHUNT THE ALARM OUTPUT OF THE DOOR CONTACT DURING VALID EGRESS. DOOR CONTACT MONITORS WHETHER THE DOOR IS OPENED, CLOSED OR HELD OPEN TOO LONG. DOOR TO REMAIN LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 04

For use on Door #(s):

D100A D101A G100

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	✓ 689	VON
2	EA	MANUAL FLUSH BOLT	FB458	626	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	L9080J LLL 17A L283-150 - LESS OUTSIDE LEVER - RHRA	626	SCH
1	EA	FSIC PERMANENT CORE	PROVIDED BY OWNER	626	SCH
1	EA	ELECTRIC STRIKE	6223 FSE CON	✓ 630	VON
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
2	EA	OH STOP & HOLDER	100HP	630	GLY
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	BLADE STOP SPACER	4110-61	689	LCN
2	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	566A	A	ZER
1	EA	WIRE HARNESS	CON-XX/XXP (AS REQ'D) - ELECTRIFIED HARDWARE TO POWER TRANSFER (EVALUATE CONDITIONS AND MODIFY WIRE LENGTH AS REQ'D)	✓	SCH
1	EA	WIRE HARNESS	CON-192P - WIRE EXTENSION FROM POWER TRANSFER TO POWER SUPPLY	✓	SCH
1	EA	CARD READER	PROVIDED BY SECURITY CONTRACTOR	✓	
2	EA	DOOR CONTACT	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	MOTION SCANNER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	POWER SUPPLY	PROVIDED BY SECURITY CONTRACTOR WEATHERSTRIP BY DOOR/FRAME MANUFACTURER	✓	

NOTES:

1) RELATED TRADES TO REFER TO WIRING DIAGRAM TO ACCOUNT FOR CONDUCTOR COUNTS, WIRE GAUGE, AND ROUGH-IN LOCATIONS.

OPERATIONAL DESCRIPTION: COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

DOORS NORMALLY CLOSED AND LOCKED VIA ACCESS CONTROL SYSTEM. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY UNLOCK THE ELECTRIC STRIKE ALLOWING ACCESS. THE MOTION SENSOR TO SHUNT THE ALARM OUTPUT OF THE DOOR CONTACTS DURING VALID EGRESS. DOOR CONTACTS MONITOR WHETHER THE DOORS ARE OPENED, CLOSED OR HELD OPEN TOO LONG. DOORS TO REMAIN LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 05

For use on Door #(s):

B101 B102 B103 B104 B105 B106
B107

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	STOREROOM LOCK	L9080J LLL 17A L283-150 - LESS OUTSIDE LEVER - PROVIDED BY BLEACHER DOOR SUPPLIER. TO BE USED FOR REFERENCE ONLY	626	SCH
1	EA	FSIC CONST CORE	PROVIDED BY OWNER	626	SCH
1	EA	FSIC PERMANENT CORE	PROVIDED BY OWNER	626	SCH
<u>1</u>	<u>EA</u>	<u>ELECTRIC STRIKE</u>	<u>6211 / 6211AL FSE CON (AS REQ'D)</u>	✓ <u>630</u>	<u>VON</u>
~~4~~	~~EA~~	~~ELECTRIC STRIKE~~	~~6211AL FSE CON~~	✓ ~~630~~	~~VON~~
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O - PROVIDED BY BLEACHER DOOR SUPPLIER. TO BE USED FOR REFERENCE ONLY	630-316	IVE
1	EA	WIRE HARNESS	CON-192P - WIRE EXTENSION FROM ELECTRIC STRIKE TO POWER SUPPLY	✓	SCH
1	EA	CARD READER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	DOOR CONTACT	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	MOTION SCANNER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	POWER SUPPLY	PROVIDED BY SECURITY CONTRACTOR BALANCE OF HARDWARE PROVIDED BY BLEACHER DOOR SUPPLIER	✓	

NOTES:

1) RELATED TRADES TO REFER TO WIRING DIAGRAM TO ACCOUNT FOR CONDUCTOR COUNTS, WIRE GAUGE, AND ROUGH-IN LOCATIONS.

OPERATIONAL DESCRIPTION: COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

UNLOCKED HOURS: DOOR ELECTRONICALLY UNLOCKED VIA ACCESS CONTROL SYSTEM, THUS IN PUSH/PULL MODE.

LOCKED HOURS: DOOR NORMALLY CLOSED AND LOCKED VIA ACCESS CONTROL SYSTEM. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY UNLOCK THE ELECTRIC STRIKE ALLOWING ACCESS.

THE MOTION SENSOR TO SHUNT THE ALARM OUTPUT OF THE DOOR CONTACT DURING VALID EGRESS. DOOR CONTACT MONITORS WHETHER THE DOOR IS OPENED, CLOSED OR HELD OPEN TOO LONG. DOOR TO REMAIN LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 06

For use on Door #(s):

101 101A 103 103A

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	✓ 689	VON
1	EA	ELEC PANIC HARDWARE	HD-QEL-98-NL-OP-110MD-CON	✓ 626	VON
1	EA	FSIC RIM HOUSING (LESS CORE)	20-079	626	SCH
1	EA	FSIC CONST CORE	PROVIDED BY OWNER	626	SCH
1	EA	FSIC PERMANENT CORE	PROVIDED BY OWNER	626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	BLADE STOP SPACER	4110-61	689	LCN
1	EA	DOOR SWEEP	8192AA	AA	ZER
1	EA	THRESHOLD	566A	A	ZER
1	EA	WIRE HARNESS	CON-XX/XXP (AS REQ'D) - ELECTRIFIED HARDWARE TO POWER TRANSFER (EVALUATE CONDITIONS AND MODIFY WIRE LENGTH AS REQ'D)	✓	SCH
1	EA	WIRE HARNESS	CON-192P - WIRE EXTENSION FROM POWER TRANSFER TO POWER SUPPLY	✓	SCH
1	EA	CARD READER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	DOOR CONTACT	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	MOTION SCANNER	PROVIDED BY SECURITY CONTRACTOR	✓	
1	EA	POWER SUPPLY	PROVIDED BY SECURITY CONTRACTOR WEATHERSTRIP BY DOOR/FRAME MANUFACTURER	✓	

NOTES:

1) RELATED TRADES TO REFER TO WIRING DIAGRAM TO ACCOUNT FOR CONDUCTOR COUNTS, WIRE GAUGE, AND ROUGH-IN LOCATIONS.

OPERATIONAL DESCRIPTION: COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

UNLOCKED HOURS: DOOR ELECTRONICALLY DOGGED DOWN VIA ACCESS CONTROL SYSTEM, THUS IN PUSH/PULL MODE.

LOCKED HOURS: DOOR NORMALLY CLOSED AND LOCKED VIA ACCESS CONTROL SYSTEM. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY RETRACT THE PANIC DEVICE LATCH ALLOWING ACCESS.

THE MOTION SENSOR TO SHUNT THE ALARM OUTPUT OF THE DOOR CONTACT DURING VALID EGRESS. DOOR CONTACT MONITORS WHETHER THE DOOR IS OPENED, CLOSED OR HELD OPEN TOO LONG. DOOR TO REMAIN LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 07

For use on Door #(s):

101B	103B	107A	107C	108A	108D
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Each to have:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
		HARDWARE BY DOOR		
		MANUFACTURER		

Hardware Group No. 08

For use on Door #(s):

S109

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<u>1</u>	<u>EA</u>	<u>CONT. HINGE</u>	<u>112HD</u>	<u>628</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>PANIC HARDWARE</u>	<u>LD-98-NL-OP-110MD</u>	<u>626</u>	<u>VON</u>
<u>1</u>	<u>EA</u>	<u>FSIC RIM HOUSING (LESS CORE)</u>	<u>20-079</u>	<u>626</u>	<u>SCH</u>
<u>1</u>	<u>EA</u>	<u>FSIC CONST CORE</u>	<u>PROVIDED BY OWNER</u>	<u>626</u>	<u>SCH</u>
<u>1</u>	<u>EA</u>	<u>FSIC PERMANENT CORE</u>	<u>PROVIDED BY OWNER</u>	<u>626</u>	<u>SCH</u>
<u>1</u>	<u>EA</u>	<u>ELECTRIC STRIKE</u>	<u>6300 FSE</u>	<u>630</u>	<u>VON</u>
<u>1</u>	<u>EA</u>	<u>90 DEG OFFSET PULL</u>	<u>8190EZHD 10" O</u>	<u>630-316</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>OH STOP</u>	<u>100S</u>	<u>630</u>	<u>GLY</u>
<u>1</u>	<u>EA</u>	<u>SURFACE CLOSER</u>	<u>4111 EDA</u>	<u>689</u>	<u>LCN</u>
<u>1</u>	<u>EA</u>	<u>BLADE STOP SPACER</u>	<u>4110-61</u>	<u>689</u>	<u>LCN</u>
<u>1</u>	<u>EA</u>	<u>DOOR SWEEP</u>	<u>8192AA</u>	<u>AA</u>	<u>ZER</u>
<u>1</u>	<u>EA</u>	<u>THRESHOLD</u>	<u>566A</u>	<u>A</u>	<u>ZER</u>
<u>1</u>	<u>EA</u>	<u>WIRE HARNESS</u>	<u>CON-192P</u>		<u>SCH</u>
			<u>- WIRE EXTENSION FROM ELECTRIC STRIKE TO POWER SUPPLY</u>		
<u>1</u>	<u>EA</u>	<u>CARD READER</u>	<u>PROVIDED BY SECURITY CONTRACTOR</u>		
<u>1</u>	<u>EA</u>	<u>MOTION SCANNER</u>	<u>PROVIDED BY SECURITY CONTRACTOR</u>		
<u>1</u>	<u>EA</u>	<u>DOOR CONTACT</u>	<u>PROVIDED BY SECURITY CONTRACTOR</u>		
<u>1</u>	<u>EA</u>	<u>POWER SUPPLY</u>	<u>PROVIDED BY SECURITY CONTRACTOR</u>		
			<u>WEATHERSTRIP BY DOOR/FRAME MANUFACTURER</u>		

NOTES:

1) RELATED TRADES TO REFER TO WIRING DIAGRAM TO ACCOUNT FOR CONDUCTOR COUNTS, WIRE GAUGE, AND ROUGH-IN LOCATIONS.

OPERATIONAL DESCRIPTION: COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

DOOR NORMALLY CLOSED AND LOCKED VIA ACCESS CONTROL SYSTEM. PRESENTING A VALID CREDENTIAL TO THE READER WILL MOMENTARILY UNLOCK THE ELECTRIC STRIKE ALLOWING ACCESS. THE MOTION SENSOR TO SHUNT THE ALARM OUTPUT OF THE DOOR CONTACT DURING VALID EGRESS. DOOR CONTACT MONITORS WHETHER THE DOOR IS OPENED, CLOSED OR HELD OPEN TOO LONG. DOOR TO REMAIN LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 09

For use on Door #(s):

P100

Each to have:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
<u>1</u>	<u>EA</u>	<u>CONT. HINGE</u>	<u>112HD</u>	<u>628</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>KEYPAD READER</u>	<u>INSTALL SALVAGED KEYPAD READER</u>		
<u>1</u>	<u>EA</u>	<u>OH STOP</u>	<u>100S</u>	<u>630</u>	<u>GLY</u>
<u>1</u>	<u>EA</u>	<u>DOOR SWEEP</u>	<u>8192AA</u>	<u>AA</u>	<u>ZER</u>
<u>1</u>	<u>EA</u>	<u>THRESHOLD</u>	<u>566A</u>	<u>A</u>	<u>ZER</u>
<u>1</u>	<u>EA</u>	<u>DOOR CONTACT</u>	<u>PROVIDED BY SECURITY CONTRACTOR</u>		
			<u>WEATHERSTRIP BY DOOR/FRAME MANUFACTURER</u>		

NOTES:

1) COORDINATE PREP REQUIRED ON NEW DOOR AND FRAME TO RE-USE SALVAGED KEYPAD LOCKSET.

OPERATIONAL DESCRIPTION: COORDINATE SYSTEM OPERATION AND COMPONENT LOCATIONS WITH THE OWNER, THE ARCHITECT, AND ALL RELATED TRADES.

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING A VALID PIN CODE TO THE KEYPAD WILL MOMENTARILY UNLOCK THE TRIM ALLOWING ACCESS. DOOR CONTACT MONITORS WHETHER THE DOOR IS OPENED, CLOSED OR HELD OPEN TOO LONG. FREE EGRESS AT ALL TIMES.

END OF SECTION 08 7100

SECTION 09 2900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Gypsum board.
 - 2. Finishing materials.
 - 3. Trim accessories.
 - 4. Acoustic insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
 - 1. Include locations of control joints.

1.3 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Qualification Statement.
- B. Installer's Qualification Statement.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install interior gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

- B. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- D. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.
 - 1. Exception: Limit deflection of walls to receive hard tile surfaces to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 GYPSUM BOARD

- A. Gypsum Board, Type X: Paper-faced gypsum panels with fire-resistant core; ASTM C1396.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered with paper face wrapping edge.
 - 3. Short Edges: Square cut.
 - 4. Type: Fire resistance rated Type X, UL or WH listed.
 - 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; Type X Gypsum Board: www.certainteed.com.
 - b. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gp.com.
 - c. National Gypsum Company; Gold Bond Brand Fire-Shield Gypsum Board: www.nationalgypsum.com.
 - d. USG Corporation; Sheetrock Brand Firecode X Panels: www.usg.com.

2.4 TRIM ACCESSORIES

- A. Trim: ASTM C1047.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ClarkDietrich Building Systems: www.clarkdietrich.com.
 - b. MarinoWARE: www.marinoware.com.
 - c. Telling Industries; www.buildstrong.com.
 - d. Phillips Manufacturing Co: www.phillipsmfg.com.
 - e. USG Corporation: www.usg.com.
 - 2. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 - a. At Contractor's option, for Cornerbeads (inside and outside corners), L-Beads, and Arches (curved edges):
 - 1) Material: Impact-resistant composite corner beads consisting of copolymer core, joint tape backing, and surface paper face.
 - 2) Products: Subject to compliance with requirements, provide the following:
 - a) CertainTeed Corp.; No-Coat Drywall Corner: www.certainteed.com.
 - 3. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.

- d. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475.
- B. Joint Tape: Paper, 2 inches wide, creased for joints and corners.
1. Exception: At tile backing panels use fiberglass tape; coated 10-by-10 glass mesh.
 2. Manufacturers: Subject to compliance with requirements, provide products from one of the specified gypsum wall board manufacturers.
- C. Joint Compound : For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound or drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound or drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound or drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
1. Use screws complying with ASTM C954 for fastening panels to steel members (cold-formed metal framing) from 0.033 inch to 0.112 inch thick.
 2. For fastening cementitious backing panels, use screws of type and size recommended by panel manufacturer.
- C. Sound-Attenuation Blankets: Produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 2. Acoustic Insulation: Provide one of the following types:
 - a. Mineral Wool Blanket Insulation (Batts): ASTM C665, Type I; preformed mineral wool, friction fit type, unfaced.
 - 1) Thickness: 3 inches, unless otherwise indicated.
 - 2) Density: 2.5 pcf.
 - 3) Flame Spread/Smoke Developed: 0/0 per ASTM E84.
 - 4) Products: Subject to compliance with requirements, provide one of the following:
 - a) Johns Manville; Mineral Wool Sound Attenuation Fire Batts (SAFB): www.jm.com.
 - b) Owens Corning; Thermafiber SAFB (Sound Attenuation Fire Batts): www.owenscorning.com.
 - c) Rockwool; Safe'n'Sound: www.rockwool.com.
 - b. Fiberglass Blanket Insulation (Batts): ASTM C665; preformed glass fiber, friction fit type, unfaced.
 - 1) Thickness: 3-1/2 inches, unless otherwise indicated.
 - 2) Products: Subject to compliance with requirements, provide one of the following:
 - a) CertainTeed Corporation/Saint-Gobain; NoiseReducer Sound Attenuation Batts: www.certainteed.com.
 - b) Johns Manville; Formaldehyde-Free Fiberglass Insulation: www.jm.com.

- c) Knauf Insulation; EcoBatt Insulation with ECOSE Technology:
www.knaufinsulation.com.
- d) Owens Corning Corporation; EcoTouch Sound Attenuation
Batts: www.owenscorning.com.

D. Acoustical Sealant: As specified in Section 07 9200 – Joint Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, 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.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. 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.
- D. 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.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. 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.
- G. 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.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. 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.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF GYPSUM BOARD

- A. Single-Layer Application:
 - 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. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- B. Multilayer Application:
 - 1. On ceilings, apply gypsum board indicated for base layers before applying face 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. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect. Place control joints consistent with lines of building spaces and as follows:
 - 1. Not more than 30 feet apart on walls and ceilings, unless otherwise indicated.
 - 2. Submit control joint locations to Architect for approval prior to installation.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. L-Bead: Use at exposed panel edges except where Drawings indicate LC-Beads.

3.5 FINISHING GYPSUM BOARD

- 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. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - a. Exception: Fire-Rated Construction shall comply with requirements of assembly listing
 - 2. Level 2: In utility areas, behind cabinetry, and in similar locations that shall not be painted or finished, and at tile backing board to receive tile finish.
 - 3. Level 4: At areas that will be exposed to view; unless otherwise indicated.

3.6 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 products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. 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 2900

SECTION 09 9100 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior painting.
 - 2. Interior painting.

1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section
- B. DFT: Dry film thickness, measured in mils.
- C. WFT: Wet film thickness, measured in mils.
- D. Mils: One one-thousandth of an inch. Used to measure thickness of coating films.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions. Include the following:
 - 1. Indicate VOC content.
 - 2. Manufacturer's name, product name and/or catalog number, and general product category.
 - a. Example of general product categories:
 - 1) Interior finish coat - latex, eggshell.
 - 2) Exterior primer for ferrous metal.
 - 3. For each paint system and substrate, indicate which paint products are to be used.
 - a. Examples:
 - 1) Interior latex eggshell system for gypsum board:
 - a) Primer: Name of specific product provided.
 - b) Finish Coats: Name of specific product provided.
 - 2) Exterior latex semigloss system for ferrous metals.
 - a) Primer: Name of specific product provided.
 - b) Finish Coats: Name of specific product provided.
 - 4. Use same designations indicated on Drawings and Schedules.
- B. Samples: Submit 3 paper "draw down" samples, 8 1/2 inch by 11 inches in size, illustrating each color and finish specified.
 - 1. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry and storefront finishes, have been approved.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and manufacturer.
- B. Paint Compatibility Certificates:

1. For Steel: From manufacturers of field-applied primers and top coats, certifying material compatibility with one another and shop-applied primers.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Paint Maintenance Manual: Submit coating maintenance manual including:
 1. Finish schedule showing where each product, color, and finish was used.
 2. Product technical data sheets.
 3. Material safety data sheets (MSDS).
 4. Care and cleaning instructions.
 5. Touch-up procedures.
 6. Repair of painted and finished surfaces.
- B. Color Chips: After final approval of all colors, submit color chips of all coatings used with manufacturer's name, product, and mix formulation of each color, finish, and coating for the purpose of future re-ordering of coatings.
 1. Color chips shall be at least six (6) inches square.
 2. Include in Paint Maintenance Manual.
- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint Products: 2 percent of that installed, but not less than 1 gal. of each material, color, and finish applied.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 5 years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years documented experience.
 1. Only qualified journeypersons, as defined by local jurisdiction, shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degF.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 degF above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
- C. Apply paint only to dry, clean, and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations:
 - 1. Provide paint and coating products from same manufacturer, unless otherwise specified.
 - 2. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats, unless otherwise specified.
 - 3. Exceptions shall be permitted, provided approval of Architect is obtained using specified procedures for substitutions.
- B. Paint Manufacturers - General: For each paint type specified in Part 2, provide one of the products listed, subject to compliance with requirements. Products shall be from one of the following:
 - 1. Benjamin Moore: Benjamin Moore & Co.: [www: benjaminmoore.com](http://www.benjaminmoore.com).
 - 2. PPC: Pittsburgh Paints Company: www.pittsburghpaintsco.com.
 - 3. Sherwin-Williams: The Sherwin-Williams Company: [www: sherwin-williams.com](http://www.sherwin-williams.com).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by top coat manufacturers for use in paint system and on substrate indicated.
 - 3. Shop-applied Primer Compatibility for Steel: Field-applied primers and top coats shall be compatible with one another and shop-applied primers. Refer to Division 05 sections for shop-applied primers for steel.
- B. VOC Content:
 - 1. Comply with the following:
 - a. Michigan Department of Environment, Great Lakes, and Energy's (EGLE) air pollution rules, Part 6: Emission Limitations and Prohibitions – Existing Sources of Volatile Organic Compound Emissions.
 - b. Ozone Transport Commission (OTC), Model Rule for Architectural and Industrial Maintenance (AIM) Coatings; as referenced in EGLE's air pollution rules, Part 6.
 - 1) OTC Phase II.
 - 2. Content Limits:
 - a. The following paint and coating categories are as defined by OTC, Model Rule for Architectural and Industrial Maintenance (AIM) Coatings. Paints and coatings shall comply with the following VOC content limits unless stricter limits are required by authorities having jurisdiction:
 - 1) Flat Coatings: 50g/L.
 - 2) Non-flat Coatings: 100g/L.
 - 3) Non-flat High Gloss Coatings: 150g/L.
 - 4) Dry Fog (Dryfall) Coatings: 150g/L.
 - 5) Industrial Maintenance Coatings: 250g/L.
 - 6) Primers, Sealers, and Undercoaters: 100g/L.
 - 7) Specialty Primers, Sealers, and Undercoaters: 100g/L.
 - 8) Rust Preventative Coatings: 250g/L.
 - 9) Zinc Rich Primers: 340g/L.
- C. Supply each paint material in quantity required to complete entire project's work from a single production run.

- D. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- E. Paint Finishes: Gloss (sheen) levels.
 - 1. Paint finishes shall be defined by the paint's gloss (sheen) level according to ASTM D523, using 60 and 85 degree geometry. Paint finish gloss levels shall be as follows:
 - a. Level 1 – Flat (Matte): Comply with both of the following:
 - 1) 60 Degrees: Value not more than 5 units.
 - 2) 85 Degrees: Value not more than 10 units.
 - b. Level 2 – Velvet: Comply with both of the following:
 - 1) 60 Degrees: Value not more than 10 units.
 - 2) 85 Degrees: Value between 10 and 35 units.
 - c. Level 3 – Eggshell: Comply with both of the following:
 - 1) 60 Degrees: Value between 10 and 25 units.
 - 2) 85 Degrees: Value between 10 and 35 units.
 - d. Level 4 – Satin: Comply with both of the following:
 - 1) 60 Degrees: Value between 20 and 35 units.
 - 2) 85 Degrees: Value not less than 35 units.
 - e. Level 5 – Semigloss:
 - 1) 60 Degrees: Value between 35 and 70 units.
 - f. Level 6 – Gloss:
 - 1) 60 Degrees: Value between 70 and 85 units.
 - g. Level 7 – High Gloss:
 - 1) 60 Degrees: Value more than 85 units.
 - 2. Product names are not acceptable for paint finish identification.
 - 3. For Part 2 of this Section paint finishes shall be defined as follows:
 - a. Flat Finish: Complying with ASTM D523 Level 1.
 - b. Low Luster Finish: Complying with ASTM D523 Level 2, 3 or 4.
 - c. Semigloss Finish: Complying with ASTM D523 Level 5.
 - d. Gloss Finish: Complying with ASTM D523 Level 6 or 7.
 - 4. Where paint finishes are not specified, provide finish as selected by Architect.
- F. Colors: As indicated in Room Finish Schedule on Drawings or, if not indicated, to match Architect's samples.
 - 1. Tint each coat including intermediate coats, one-half shade lighter than succeeding coat, with final top coat as indicated color.
 - 2. Provide tinted deep tone primers at deep tone colors, and as recommended by paint manufacturer.

2.3 EXTERIOR PAINTS

- A. General:
 - 1. Unless otherwise indicated, each exterior paint system consists of the following:
 - a. Primer: One coat based on substrate material.
 - b. Top Coats: Two coats based on required finish and substrate material.
 - 2. Required Finishes: For each paint system, provide paint finishes as follows unless otherwise indicated:
 - a. All exterior paint systems: Semigloss finish.
- B. Exterior Paint Systems - Latex
 - 1. Primers:

- a. Primer for aluminum, ferrous metal, and galvanized steel: Rust-inhibitive acrylic/latex primer, water-based.
 - 1) Benjamin Moore; High Performance Acrylic Metal Primer HP1100; DFT 2.0 to 2.7 mils.
 - 2) PPC; Pitt-Tech Plus Int./Ext. DTM Industrial Primer 4020PF; DFT 2.2 to 3.5 mils.
 - 3) Sherwin Williams; Pro Industrial Pro-Cryl Universal Primer B66 Series; DFT 1.9 to 3.8 mils.
- 2. Top Coats:
 - a. Semigloss Finish: Acrylic/latex paint, water-based.
 - 1) Finish coats for all surfaces except metals:
 - a) Benjamin Moore; Ultra Spec EXT Gloss Finish N449; DFT 1.5 mils.
 - b) PPC; Speedhide Exterior 100% Acrylic Semi-Gloss 6-900XI Series; DFT 1.4 mils.
 - c) Sherwin-Williams; SuperPaint Exterior Latex Gloss A84 Series; DFT 1.5 mils.
 - 2) Finish coats for aluminum, ferrous metal, and galvanized steel:
 - a) Benjamin Moore; High Performance DTM Acrylic Enamel Semi-Gloss HP3310; DFT 1.8 to 2.4 mils.
 - b) PPC; Pitt-Tech Plus EP DTM Acrylic Semi-Gloss 90-1610 Series; DFT 2.0 to 4.0 mils.
 - c) Sherwin-Williams; Pro Industrial DTM Acrylic Semi-Gloss, B66 Series; DFT 2.4 to 4.0 mils.

2.4 INTERIOR PAINTS

- A. General:
 - 1. Unless otherwise indicated, each interior paint system consists of the following:
 - a. Primer: One coat based on substrate material.
 - b. Intermediate Coats: One coat, if indicated, based on substrate material.
 - c. Top Coats: Two coats, one if intermediate coat was applied, based on required finish and substrate material.
 - 2. Required Finishes: For each paint system, provide paint finishes as follows unless otherwise indicated:
 - a. Ceilings, Soffits and Ceiling Drops: Flat finish.
 - b. Gypsum Board(except at ceilings):
 - 1) Semigloss Finish: Storage rooms, janitor closets, electrical rooms, mechanical rooms, closets, and similar non-public areas.
 - 2) Semigloss Finish: Public areas.
 - c. Masonry: Semigloss finish.
 - d. Metals: Semigloss finish.
 - e. Wood (except at ceilings): Semigloss finish.
 - f. Insulated Piping and Insulated Ductwork: Finish to match surface it is mounted on unless otherwise indicated.
- B. Interior Paint Systems - Latex.
 - 1. Primers:
 - a. Block Filler/primer for concrete masonry units: Acrylic/latex block filler, water-based.
 - 1) Benjamin Moore; Ultra Spec Hi-Build Masonry Block Filler 571; DFT 8.5 to 11.0 mils.
 - 2) PPC; Speedhide Interior/Exterior Masonry Hi Fill Latex Block Filler 6-15XI; DFT 8.0 mils.
 - 3) Sherwin Williams; Pro Industrial Heavy Duty Block Filler B42 Series; DFT 8.0 to 10.5 mils.
 - b. Primer for aluminum, ferrous metal, and galvanized steel: Rust-inhibitive acrylic/latex primer, water-based.

- 1) Benjamin Moore; High Performance Acrylic Metal Primer HP1100; DFT 2.0 to 2.7 mils.
 - 2) PPC; Pitt-Tech Plus Int./Ext. DTM Industrial Primer 4020PF; DFT 2.2 to 3.5 mils.
 - 3) Sherwin Williams; Pro Industrial Pro-Cryl Universal Primer B66 Series; DFT 1.9 to 3.8 mils.
 - c. Primer for gypsum board: Acrylic/latex primer, water-based.
 - 1) Benjamin Moore; Multi-Purpose Primer 067; DFT 1.3 to 1.6 mils.
 - 2) PPC; Speedhide Zero Interior Zero VOC & Low Odor Primer 6-4900XI; DFT 1.4 mils.
 - 3) Sherwin Williams; ProMar 200 Zero V.O.C. Interior Latex Primer, B28W02600; DFT 1.0 mils.
 - d. Primer for insulated piping and insulated ductwork: Acrylic/latex stain-blocking primer/sealer with high adhesion, water-based.
 - 1) Benjamin Moore; Insl-X Prime All Multi-Surface Latex Primer Sealer AP-1000; DFT 1.3 mils.
 - 2) PPC; Seal Grip Gripper Interior/Exterior 100% Acrylic Latex Primer 17-921XI Series; DFT 1.6 mils.
 - 3) Sherwin Williams; PrepRite ProBlock Interior-Exterior Latex Primer-Sealer B51-600 Series; DFT 1.4 mils.
2. Intermediate Coats: Provide intermediate coats only where indicated below for specific manufacturers, finishes and substrate materials.
- a. Low Luster Finishes:
 - 1) Intermediate coats for aluminum, ferrous metal, and galvanized steel:
 - a) Benjamin Moore; Ultra Spec HP D.T.M. Acrylic Low Luster Enamel HP25; DFT 1.8 to 2.5 mils.
3. Top Coats:
- a. Semigloss Finish: Acrylic/latex paint, water-based.
 - 1) Finish coats for all surfaces except metals:
 - a) Benjamin Moore; Super Hide Interior Latex Semi-Gloss N298; DFT 1.2 to 1.3 mils.
 - b) PPC; Speedhide Zero Interior Latex Semi-Gloss 6-5510 Series; DFT 1.5 mils.
 - c) Sherwin-Williams; ProMar 200 Zero V.O.C. Interior Latex Gloss B21-12650 Series; DFT 1.4 mils.
 - 2) Finish coats for aluminum, ferrous metal, and galvanized steel:
 - a) Benjamin Moore; High Performance DTM Acrylic Enamel Semi-Gloss HP3310; DFT 1.8 to 2.4 mils.
 - b) PPC; Pitt-Tech Plus EP DTM Acrylic Semi-Gloss 90-1610 Series; DFT 2.0 to 4.0 mils.
 - c) Sherwin-Williams; Pro Industrial DTM Acrylic Semi-Gloss B66 Series; DFT 2.4 to 4.0 mils.
 - b. Low Luster Finish: Acrylic/latex paint, water-based.
 - 1) Finish coats for all surfaces except metals:
 - a) Benjamin Moore; Super Hide Interior Latex Low Sheen Eggshell N296; DFT 1.3 to 1.5 mils.
 - b) PPC; Speedhide Zero Interior Latex Paint Satin 6-5410 Series; DFT 1.4 mils.
 - c) Sherwin-Williams; ProMar 200 Zero V.O.C. Interior Latex Eg-Shel B20 Series; DFT 1.8 mils.
 - 2) Finish coats for aluminum, ferrous metal, and galvanized steel:
 - a) Benjamin Moore; High Performance DTM Acrylic Enamel Satin HP3320; DFT 1.7 to 2.0 mils.
 - b) PPC; Pitt-Tech Plus EP DTM Acrylic Satin 90-1710 Series; DFT 2.0 to 4.0 mils.
 - c) Sherwin-Williams; Pro Industrial DTM Acrylic Eg-Shel B66 Series; DFT 2.5 to 4.0 mils.

- c. Flat Finish: Acrylic/latex paint, water-based.
 - 1) Finish coats for all surfaces:
 - a) Benjamin Moore; Super Hide Interior Latex Flat N295; DFT 1.3 to 1.5 mils.
 - b) PPC; Speedhide Zero Interior -Latex Paint Flat 6-5110 Series; DFT 1.2 mils.
 - c) Sherwin Williams; ProMar 200 Zero V.O.C. Interior Latex Flat B30-2600 Series; DFT 1.4 mils.

2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Provide cleaning materials, preparation materials, and miscellaneous materials required to properly prepare and apply paints and coatings.
 - 1. Includes materials required for marking fire and smoke assemblies

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMUs): 12 percent.
 - 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Protect adjacent surfaces not to be painted.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. For coatings applied over previously painted surfaces, test application to check for lifting and other adhesion problems. Perform test in an isolated area where practicable.
 - 2. Remove incompatible coatings and primers or apply barrier tie coat as recommended by paint manufacturer and as required to produce paint systems indicated.
- D. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates - Unpainted or Unprimed: Remove rust, loose mill scale, and any other surface contamination. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP6 - Commercial Blast Cleaning.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Sand and scrape to remove loose primer and rust. Feather edges of remaining primer to make inconspicuous.
 1. Clean using methods recommended in writing by paint manufacturer.
 2. Before applying finish coats, applicator/installer shall re-prime entire shop-primed item with steel primer specified in this section.
- H. Galvanized-Metal Substrates: Remove passivation coating/rinse, grease and oil residue from galvanized metal to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Clean using methods recommended in writing by paint manufacturer but not less than ASTM D6386, ASTM D7396, and the following:
 1. Remove surface contamination and oils in accordance with SSPC-SP 1 - Solvent Cleaning.
 2. Remove loose paint, rust, and other debris according to SSPC-SP 2 - Hand Tool Cleaning.
 3. Lightly profile galvanized surfaces and remove zinc oxide and zinc hydroxide layers in accordance with SSPC-SP16 – Brush-Off/Sweep Blast Cleaning.
 4. Apply paint within 1 hour of cleaning and preparation.
- I. Wood Substrates:
 1. Scrape and clean knots; apply coat of knot sealer before applying primer.
 2. Sand surfaces that will be exposed to view and dust off.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill nail holes and other holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

I.J. Repair of Existing Gypsum Board:

1. Fill hairline cracks, small holes, and imperfections with filler compound and sand smooth.

3.3 APPLICATION - GENERAL

- A. Apply paints and coatings according to manufacturer's written instructions.
 1. Use applicators and techniques suited for paint and substrate indicated.
- B. Provide smooth, opaque coatings of uniform finish, color, appearance, and coverage without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
- C. Terminate paint in neat lines; cut in sharp lines and color breaks.
- D. Apply paint products to properly prepared surfaces.
 1. Do not apply coatings over dirt, rust, scale, grease, moisture, or other conditions detrimental to application of coatings.
- E. Primers:
 1. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
 2. Apply first coat of primer to surfaces as soon as practical after preparation and before subsequent surface deterioration.
 3. Re-prime shop-primed surfaces.
- F. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 1. Sand between coats as recommended by manufacturer; before applying next coat clean surfaces of loose particles and use tack cloth to remove any remaining dust and particles just prior to applying next coat.

- G. Provide completed work matching approved samples for color, finish, texture, coverage and quality of work.
 - 1. Remove, refinish, or repaint work not complying with requirements.
- H. Number of Coats: Each paint system in Part 2 specifies a number of coats. This is the minimum number required.
 - 1. If undercoats, stains, or other imperfections are visible after final coat of paint, apply additional coats until paint is of uniform finish, color, and appearance without defects or imperfections.
- I. Minimum Coating Thickness: Provide dry film thickness for each coating as indicated, but not less than that recommended by the coating manufacturer.
 - 1. Number of coats and film thicknesses required are same regardless of application method.
 - 2. Ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
- J. Maximum Coating Thickness:
 - 1. For ladder rungs with slip-resistant coatings as specified in 05 5000 - Metal Fabrications, maximum overall coating thickness shall not exceed 10 mils.

3.4 SURFACES TO BE PAINTED

- A. General: Paint all exposed surfaces except where indicated not to be painted or where listed in "Surfaces Not to Be Painted" Article in this section.
 - 1. The term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.
 - 2. If surface, material, or item is not specifically mentioned, paint in same manner, color, and sheen as similar surfaces, materials, or items, regardless of whether indicated or not.
 - 3. Paint surfaces that are cut and patched including, but not limited to, cutting and patching to permit installation of electrical services, piping, and ductwork.
- B. Exposed Ceilings:
 - 1. Paint entire exposed ceiling area including, but not limited to, deck, miscellaneous steel, hangers, fasteners, and miscellaneous items and hardware, unless otherwise indicated.
 - 2. Paint the following mechanical and electrical items unless otherwise indicated:
 - a. Insulated piping, pipe hangers, and supports
 - b. Ductwork, insulated ducts, and supports.
 - c. Conduit, fittings and junction boxes:
 - 3. Do not paint sprinkler heads and other factory finished fire protection components.
- C. Equipment and Furniture:
 - 1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.
 - 2. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of permanent item.
- D. Registers and Grilles: Paint interior surfaces of ducts, for a minimum of 18 inches or beyond sight line, whichever is greater, with a flat black (non-reflecting) paint.
- E. Access Panels: Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
- F. Doors:
 - 1. Exterior Doors: Finish doors on tops, bottoms, and all four edges the same as exterior faces.
 - 2. Interior Doors: Finish doors on tops, bottoms, and all four edges the same as face of non-secured side.
- G. Panelboards for Service Panels, Telephone, and Other Electrical Equipment:

1. Paint both sides and all edges of plywood before installation.
 - a. Color and Finish: Gray, semigloss, unless otherwise indicated.

H. Mechanical and Electrical:

1. This Section includes painting of all mechanical, fire protection, and electrical items.
 - a. Do not paint sprinkler heads and polished fire protection components.
 - b. Do not paint insulated pipe, duct work or equipment before insulation is applied.
2. Piping, Insulated Piping, Pipe Hangers, and Supports:
 - a. Entire circumference of piping shall be painted.
 - b. In finished/public areas, paint exposed piping the same color and finish as surface it is mounted on unless otherwise indicated.
 - c. In utility areas, paint exposed piping according to piping color coding scheme; otherwise paint the same color and finish as surface it is mounted on unless otherwise indicated.
 - d. Paint all exposed pipe hangers and supports the same color and finish as surface it is mounted on unless otherwise indicated.
 - 1) Any portion of hangers and supports encompassing the actual pipe shall be painted to match the pipe color and finish.
3. Ductwork, Insulated Ducts, and Supports:
 - a. In finished/public areas, paint exposed ductwork and supports the same color and finish as surface it is mounted on unless otherwise indicated.
 - b. In utility areas, paint exposed ductwork according to color coding scheme; otherwise paint the same color and finish as surface it is mounted on unless otherwise indicated.
 - c. Paint all exposed hangers and supports the same color and finish as surface it is mounted on unless otherwise indicated.
 - 1) Any portion of hangers and supports encompassing the actual ductwork shall be painted to match the ductwork color and finish.
4. Electrical Conduit, Fittings and Junction Boxes:
 - a. In finished/public areas, paint exposed conduit, fittings and junction boxes same color and finish as surface it is mounted on unless otherwise indicated.
 - b. In utility areas, paint exposed conduit, fittings and junction boxes according to color coding scheme; otherwise paint the same color and finish as surface it is mounted on unless otherwise indicated.
5. Mechanical and Electrical Equipment:
 - a. Exterior Equipment: Paint all equipment exposed to the weather.
 - 1) Do not paint factory-finished equipment unless otherwise indicated.
 - b. Paint shop-primed mechanical and electrical equipment same color and finish as surface it is mounted on unless otherwise indicated.
 - c. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
 - d. Paint interior surfaces of convector and baseboard heating cabinets to match face panels.

3.5 SURFACES NOT TO BE PAINTED

- A. Do not paint or finish the following unless otherwise indicated:
1. Factory-finished items; factory-primed items are not considered factory-finished.
 2. Items indicated to receive other finish.
 3. Items indicated to remain naturally finished.
 4. Fire rating labels.
 5. Equipment serial number and capacity labels.
 6. Operating parts of equipment.
 7. Aluminum components.

8. Polished and brushed stainless steel items.
9. Metal flashings.
10. Brick.
11. Decorative concrete masonry units.
12. Cast-in-place concrete.
13. Floors.
14. Surfaces concealed by suspended ceilings.
15. Concealed piping, ductwork, and conduit.
16. Surfaces within pipe and duct spaces.
17. Acoustical materials.

3.6 FIELD QUALITY CONTROL

- A. Subject to the opinion of the Architect, paint shall be rejected and considered unacceptable for any of the following reasons:
 1. Lacking minimum dry film thicknesses.
 2. Poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, and corners.
 3. Damage from touching, or disturbing paint in any other manner, before sufficiently dry.
 4. Damage from application to moist surfaces or damage caused by inadequate protection from the weather.
 5. Damage or contamination of paint from blown contaminants including but not limited to dust.
 6. Paint shall be rejected if any of the following are evident under natural lighting for exterior surfaces and final lighting source, including daylighting, for interior surfaces:
 - a. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
 - b. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
 - c. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
- B. Visible defects are defined as follows:
 1. Brush and roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 2. When the final coat on any surface exhibits a lack of uniformity of color, finish, texture, and hiding across full surface area.
- C. Rejected paint shall be repaired or replaced at the expense of the Contractor.
 1. Small affected areas shall be touched up.
 2. Large affected areas shall be repainted.
 3. Small and large areas shall be as defined by the Architect.
 4. Areas without sufficient dry film thickness shall be repainted.
 5. Paint runs and sags shall be removed by scraper or sanding and repainted.

3.7 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 1. Do not clean equipment with free-draining water. Prevent solvents, thinners, cleaners, and other contaminants from entering waterways, sanitary and storm drain systems, and ground.
 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 3. Allow empty paint cans to dry before disposal.

- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 09 9100

SECTION 09 9600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. High performance coatings.

1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section
- B. DFT: Dry film thickness, measured in mils.
- C. WFT: Wet film thickness, measured in mils.
- D. Mils: One one-thousandth of an inch. Used to measure thickness of coating films.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions. Include the following:
 - 1. Indicate VOC content.
 - 2. Manufacturer's name, product name and/or catalog number, and general product category.
 - a. Example of general product categories:
 - 1) Interior finish coat - latex, eggshell.
 - 2) Exterior primer for ferrous metal.
 - 3. For each high-performance coating system and substrate, indicate which products are to be used.
 - a. Examples:
 - 1) Interior Waterborne Acrylic Epoxy Paint for Concrete Masonry Units:
 - a) Primer: Name of specific product provided.
 - b) Finish Coats: Name of specific product provided.
 - 2) Interior High Performance Coating for Structural Steel.
 - a) Primer: Name of specific product provided.
 - b) Intermediate Coat: Name of specific product provided.
 - c) Top Coat: Name of specific product provided.
 - 4. Use same designations indicated on Drawings and Schedules.
- B. Samples: Submit 3 paper "draw down" samples, 8.5 inch by 11 inches in size, illustrating each color and finish specified.
 - 1. High-performance coating color submittals will not be considered until color submittals for major materials not to be painted, such as masonry and storefront finishes, have been approved.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and manufacturer.
- B. High Performance Coating Compatibility Certificates:

1. For Steel: From manufacturers of field-applied primers and top coats, certifying material compatibility with one another and shop-applied primers.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Paint Maintenance Manual: Submit coating maintenance manual including:
 1. Finish schedule showing where each product, color, and finish was used.
 2. Product technical data sheets.
 3. Material safety data sheets (MSDS).
 4. Care and cleaning instructions.
 5. Touch-up procedures.
 6. Repair of painted and finished surfaces.
- B. Color Chips: After final approval of all colors, submit color chips of all coatings used with manufacturer's name, product, and mix formulation of each color, finish, and coating for the purpose of future re-ordering of coatings.
 1. Color chips shall be at least six (6) inches square.
 2. Include in Paint Maintenance Manual.
- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Coating Products: 2 percent of that installed, but not less than 1 gal. of each material, color, and finish applied.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 5 years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years documented experience.
 1. Only qualified journeypersons, as defined by local jurisdiction, shall be engaged in high-performance coating work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees Fahrenheit.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees Fahrenheit.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures of less than 5 degrees Fahrenheit above the dew point; or to damp or wet surfaces.
 1. Work may continue during inclement weather if surfaces and areas to be coated are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
- C. Apply coatings only to dry, clean, and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations:
 - 1. Provide coating products for each system from same manufacturer, unless otherwise specified.
 - 2. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats, unless otherwise specified.
 - 3. Exceptions shall be permitted, provided approval of Architect is obtained using specified procedures for substitutions.
- B. High Performance Coating Manufacturers: For each coating specified in Part 2, provide one of the products listed, subject to compliance with requirements. Products shall be from one of the following:
 - 1. Benjamin Moore: Benjamin Moore & Co.: [www: benjaminmoore.com](http://www.benjaminmoore.com).
 - 2. Carboline Company www.carboline.com.
 - 3. PPC: Pittsburgh Paints Company: www.pittsburghpaintsco.com.
 - 4. Sherwin-Williams: The Sherwin-Williams Company: [www: sherwin-williams.com](http://www.sherwin-williams.com).
 - 5. Tnemec: Tnemec Company Inc.: www.tnemec.com.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Provide high performance coatings where indicated on Drawings; otherwise provide paints as specified in Section 09 9100 – Painting.
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by top coat manufacturers for use in paint system and on substrate indicated.
 - 3. Shop-applied Primer Compatibility for Steel: Field-applied primers and top coats shall be compatible with one another and shop-applied primers. Refer to Division 05 sections for shop-applied primers for steel.
- C. VOC Content:
 - 1. Comply with the following:
 - a. Michigan Department of Environment, Great Lakes, and Energy's (EGLE) air pollution rules, Part 6: Emission Limitations and Prohibitions – Existing Sources of Volatile Organic Compound Emissions.
 - b. Ozone Transport Commission (OTC), Model Rule for Architectural and Industrial Maintenance (AIM) Coatings; as referenced in EGLE's air pollution rules, Part 6.
 - 1) OTC Phase II.
 - 2. Content Limits:
 - a. The following paint and coating categories are as defined by OTC, Model Rule for Architectural and Industrial Maintenance (AIM) Coatings. Paints and coatings shall comply with the following VOC content limits unless stricter limits are required by authorities having jurisdiction:
 - 1) Flat Coatings: 50g/L.
 - 2) Non-flat Coatings: 100g/L.
 - 3) Non-flat High Gloss Coatings: 150g/L.
 - 4) Dry Fog (Dryfall) Coatings: 150g/L.
 - 5) Industrial Maintenance Coatings: 250g/L.
 - 6) Primers, Sealers, and Undercoaters: 100g/L.
 - 7) Specialty Primers, Sealers, and Undercoaters: 100g/L

- 8) Rust Preventative Coatings: 250g/L.
 - 9) Zinc Rich Primers: 340g/L.
- D. Supply each coating material in quantity required to complete entire project's work from a single production run.
- E. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- F. Coating Finishes: Gloss (sheen) levels.
- 1. Coating finishes shall be defined by the coating's gloss (sheen) level according to ASTM D523, using 60 and 85 degree geometry. Coating finish gloss levels shall be as follows:
 - a. Level 1 – Flat (Matte): Comply with both of the following:
 - 1) 60 Degrees: Value not more than 5 units.
 - 2) 85 Degrees: Value not more than 10 units.
 - b. Level 2 – Velvet: Comply with both of the following:
 - 1) 60 Degrees: Value not more than 10 units.
 - 2) 85 Degrees: Value between 10 and 35 units.
 - c. Level 3 – Eggshell: Comply with both of the following:
 - 1) 60 Degrees: Value between 10 and 25 units.
 - 2) 85 Degrees: Value between 10 and 35 units.
 - d. Level 4 – Satin: Comply with both of the following:
 - 1) 60 Degrees: Value between 20 and 35 units.
 - 2) 85 Degrees: Value not less than 35 units.
 - e. Level 5 – Semigloss:
 - 1) 60 Degrees: Value between 35 and 70 units.
 - f. Level 6 – Gloss:
 - 1) 60 Degrees: Value between 70 and 85 units.
 - g. Level 7 – High Gloss:
 - 1) 60 Degrees: Value more than 85 units.
 - 2. Product names are not acceptable for coating finish identification.
 - 3. For Part 2 of this Section coating finishes shall be defined as follows:
 - a. Flat Finish: Complying with ASTM D523 Level 1.
 - b. Low Luster Finish: Complying with ASTM D523 Level 2, 3 or 4.
 - c. Semigloss Finish: Complying with ASTM D523 Level 5.
 - d. Gloss Finish: Complying with ASTM D523 Level 6 or 7.
 - 4. Where coating finishes are not specified, provide finish as selected by Architect.
- G. Colors: As indicated in Room Finish Schedule on Drawings or, if not indicated, to match Architect's samples.
- 1. For opaque coatings, tint each coat including intermediate coats, one-half shade lighter than succeeding coat, with final top coat as indicated color.

2.3 HIGH PERFORMANCE COATINGS

- A. General:
- 1. Unless otherwise indicated, each high performance coating system consists of the following:
 - a. Primer: One coat based on substrate material.
 - b. Top Coats: Two coats based on required finish and substrate material.
 - 2. Required Finishes: For each high performance coating, provide paint finishes as follows unless otherwise indicated:

- a. All High performance coatings: Semigloss finish.
- 3. Excludes the following:
 - a. High performance coatings for metals indicated in "High Performance Coatings for Metals" Article below
- B. Interior High Performance Systems.
 - 1. Primers:
 - a. Block Filler/primer for concrete masonry units: Acrylic/latex block filler, water-based.
 - 1) Benjamin Moore: Ultra Spec Hi Build Masonry Block Filler 571; DFT 8.5 to 11.3 mils.
 - 2) Carboline; Sanitile 100; DFT 6.0 to 12.0 mils.
 - 3) PPC: Speedhide Interior/Exterior Masonry Hi Fill Latex Block Filler 6-15; DFT 7.0 mils.
 - 4) Sherwin Williams:
 - a) For Semigloss and Low Luster Finish Top Coats: Loxon Acrylic Block Surfacers LX01 Series; DFT 8.8 mils.
 - 5) Tnemec; Masonry Filler Series 54; DFT 8.0 to 10.0 mils.
 - b. Primer for aluminum, ferrous metal, and galvanized steel aluminum, ferrous metal, and galvanized steel: Rust-inhibitive acrylic/latex primer, water-based.
 - 1) Benjamin Moore; High Performance Acrylic Metal Primer HP1100; DFT 2.0 to 2.7 mils.
 - 2) Carboline; Carbocrylic 3358MC; DFT 2.0 to 3.0 mils.
 - 3) PPC; Pitt-Tech Plus 4020 PF; DFT 2.2 to 3.5 mils.
 - 4) Sherwin Williams; Pro Industrial Pro-Cryl Universal Primer B66 Series; DFT 1.9 to 3.8 mils.
 - 5) Tnemec; Uni-Bond DF Series 115 or Uni-Bond Series 116; DFT 2.0 to 4.0 mils.
 - c. Primer for wood and gypsum board: Two-component epoxy or acrylic/latex primer, water-based.
 - 1) Benjamin Moore; Multi-Purpose Primer 067; DFT 1.3 to 1.6 mils.
 - 2) Carboline; Sanitile 120; DFT 1.0 to 2.0 mils.
 - 3) PPC; Speedhide 6-2 Interior Quick-Drying Latex Sealer; DFT 1.2 mils.
 - 4) Sherwin Williams; ProMar 200 Zero V.O.C. Interior Latex Primer B28W02600; DFT 1.0 mils.
 - 5) Tnemec; Elasto-Grip FC Series 151-1051; DFT 0.75 to 1.5 mils.
 - d. Primer for previously painted surfaces; including concrete and masonry: Acrylic/latex stain-blocking primer/sealer with high adhesion, water-based.
 - 1) Benjamin Moore; Insul-X Prime All Multi-Surface Latex Primer Sealer AP-1000; DFT 1.3 mils.
 - 2) Carboline; Sanitile 120; DFT 1.0 to 2.0 mils.
 - 3) PPC; Seal Grip Gripper Interior/Exterior 100% Acrylic Latex Primer 17-921XI Series; DFT 1.6 mils.
 - 4) Sherwin Williams; PrepRite ProBlock Interior-Exterior Latex Primer-Sealer B51-600 Series; DFT 1.4 mils.
 - 5) Tnemec; Elasto-Grip FC Series 151-1051; DFT 0.75 to 1.5 mils.
 - e. Primer for insulated piping and insulated ductwork: Acrylic/latex stain-blocking primer/sealer with high adhesion, water-based.
 - 1) Benjamin Moore; Insul-X Prime All Multi-Surface Latex Primer Sealer AP-1000; DFT 1.3 mils.
 - 2) Carboline; Sanitile 120; DFT 1.0 to 2.0 mils.
 - 3) PPC; Seal Grip Gripper Interior/Exterior 100% Acrylic Latex Primer 17-921XI Series; DFT 1.6 mils.
 - 4) Sherwin Williams; PrepRite ProBlock Interior-Exterior Latex Primer-Sealer B51-600 Series; DFT 1.4 mils.
 - 5) Tnemec; Uni-Bond DF Series 115 or Uni-Bond Series 116; DFT 2.0 to 4.0 mils.

2. Top Coats:

- a. Semigloss Finish: Single or multi component, waterbased, acrylic epoxy.
 - 1) Finish coats for all surfaces:
 - a) Benjamin Moore; Pre-Catalyzed Waterborne Epoxy Semi-Gloss HP3410; DFT 1.5 to 1.9 mils.
 - b) Carboline; Carbocrylic 3359 MC - Semi-Gloss; DFT 2.0 to 3.0 mils.
 - c) PPC; Aquapon WB EP Semi-Gloss 98E Series; DFT 2.0 to 3.0 mils.
 - d) Sherwin Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss K46 Series; DFT 1.5 mils.
 - e) Tnemec; Enviro-Pox Series 289 ; DFT 4.0 to 6.0 mils.
- b. Low Luster Finish: Single or multi component, waterbased, acrylic or amine epoxy.
 - 1) Finish coats for all surfaces:
 - a) Benjamin Moore; Pre-Catalyzed Waterborne Epoxy Eggshell HP3420; DFT 1.5 to 1.7 mils.
 - b) Carboline; Carbocrylic 3350; 2.0 to 3.0 mils
 - c) PPC; Pitt-Glaze WB1 Interior Pre-Catalyzed Acrylic Water-Borne Epoxy Eggshell 16-310 Series; DFT 1.5 mils.
 - d) Sherwin Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy, Eg-Shel K45 Series; DFT 1.4 mils.
 - e) Tnemec; Enviro-Pox Series 289; DFT 4.0 to 6.0 mils.

2.4 ACCESSORY MATERIALS

- A. Accessory Materials: Provide cleaning materials, preparation materials, and miscellaneous materials required to properly prepare and apply coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMUs): 12 percent.
 - 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Protect adjacent surfaces not to be painted.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. For coatings applied over previously painted surfaces, test application to check for lifting and other adhesion problems. Perform test in an isolated area where practicable.

2. Remove incompatible coatings and primers or apply barrier tie coat as recommended by paint manufacturer and as required to produce paint systems indicated.
- D. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates - Unpainted or Unprimed: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 1. SSPC-SP6 - Commercial Blast Cleaning.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Sand and scrape to remove loose primer and rust. Feather edges of remaining primer to make inconspicuous.
 1. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - a. SSPC-PA1.
 2. Before applying finish coats, applicator/installer shall re-prime entire shop-primed item with steel primer specified in this section.
- H. Galvanized-Metal Substrates: Remove passivation coating/rinse, grease and oil residue from galvanized metal to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Clean using methods recommended in writing by paint manufacturer but not less than ASTM D6386, ASTM D7396, and the following:
 1. Remove surface contamination and oils in accordance with SSPC-SP 1 - Solvent Cleaning.
 2. Remove loose paint, rust, and other debris according to SSPC-SP 2 - Hand Tool Cleaning.
 3. Lightly profile galvanized surfaces and remove zinc oxide and zinc hydroxide layers in accordance with SSPC-SP16 – Brush-Off/Sweep Blast Cleaning.
 4. Apply paint within 1 hour of cleaning and preparation.
- I. Aluminum Substrates: Remove loose surface oxidation. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 1. SSPC-SP 1 - Solvent Cleaning.
 2. Where required or recommended by coating manufacturer, lightly abrade uniformly to create a surface profile acceptable to coating manufacturer.
- J. Wood Substrates:
 1. Scrape and clean knots; apply coat of knot sealer before applying primer.
 2. Sand surfaces that will be exposed to view and dust off.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill nail holes and other holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Previously Painted Surfaces - General:
 1. Remove all surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, and any other surface contamination.
 2. Remove masking tape, labels, adhesives, and other materials that would either be deleterious to adhesion of, or show through, new paint.
 3. Scrape all loose, blistered, peeling, scratched or otherwise imperfect paint down to bare substrate and sand adjacent tightly adhering paint to feather edge.
 4. Spot prime all bare areas with appropriate primer before priming entire surface.

- L. Repair of Existing Gypsum Board:
 - 1. Fill hairline cracks, small holes, and imperfections with filler compound and sand smooth.

3.3 APPLICATION - GENERAL

- A. Apply coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
- B. Provide smooth, opaque coatings of uniform finish, color, appearance, and coverage without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
- C. Terminate coatings in neat lines; cut in sharp lines and color breaks.
- D. Apply coating products to properly prepared surfaces.
 - 1. Do not apply coatings over dirt, rust, scale, grease, moisture, or other conditions detrimental to application of coatings.
- E. Primers:
 - 1. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
 - 2. Apply first coat of primer to surfaces as soon as practical after preparation and before subsequent surface deterioration.
 - 3. Re-prime shop-primed surfaces.
- F. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
 - 1. Sand between coats as recommended by manufacturer; before applying next coat clean surfaces of loose particles and use tack cloth to remove any remaining dust and particles just prior to applying next coat.
- G. Provide completed work matching approved samples for color, finish, texture, coverage and quality of work.
 - 1. Remove, refinish, or repaint work not complying with requirements.
- H. Number of Coats: Each coating system in Part 2 specifies a number of coats. This is the minimum number required.
 - 1. If undercoats, stains, or other imperfections are visible after final coating is applied, apply additional coats until paint is of uniform finish, color, and appearance without defects or imperfections.
- I. Minimum Coating Thickness: Provide dry film thickness for each coating as indicated, but not less than that recommended by the coating manufacturer.
 - 1. Number of coats and film thicknesses required are same regardless of application method.
 - 2. Ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
- J. Maximum Coating Thickness:
 - 1. For ladder rungs with slip-resistant coatings as specified in 05 5000 - Metal Fabrications, maximum overall coating thickness shall not exceed 10 mils.

3.4 SURFACES TO BE COATED

- A. Refer to Section 09 9100 - Painting.

3.5 SURFACES NOT TO BE COATED

- A. Refer to Section 09 9100 - Painting.

3.6 IDENTIFICATION AND COLOR CODING

- A. Refer to Section 09 9100 - Painting.

3.7 FIELD QUALITY CONTROL

- A. Subject to the opinion of the Architect, coatings shall be rejected and considered unacceptable for any of the following reasons:
1. Lacking minimum dry film thicknesses.
 2. Poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, and corners.
 3. Damage from touching, or disturbing coatings in any other manner, before sufficiently dry.
 4. Damage from application to moist surfaces or damage caused by inadequate protection from the weather.
 5. Damage or contamination of coatings from blown contaminants including, but not limited to, dust.
 6. Coatings shall be rejected if any of the following are evident under natural lighting for exterior surfaces and final lighting source, including daylighting, for interior surfaces:
 - a. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
 - b. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
 - c. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
- B. Visible defects are defined as follows:
1. Brush and roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 2. When the final coat on any surface exhibits a lack of uniformity of color, finish, texture, and hiding across full surface area.
- C. Rejected coatings shall be repaired or replaced at the expense of the Contractor.
1. Small affected areas shall be touched up.
 2. Large affected areas shall be repainted.
 3. Small and large areas shall be as defined by the Architect.
 4. Areas without sufficient dry film thickness shall be repainted.
 5. Paint runs and sags shall be removed by scraper or sanding and repainted.

3.8 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
1. Do not clean equipment with free-draining water. Prevent solvents, thinners, cleaners, and other contaminants from entering waterways, sanitary and storm drain systems, and ground.
 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 3. Allow empty paint cans to dry before disposal.
- B. After completing coating application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coatings surfaces.

END OF SECTION 09 9600

HIGH-PERFORMANCE COATINGS

09 9600 - 9

Issued 10/22/26; Addendum 1

SECTION 20 0548 - VIBRATION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Provide vibration control items for isolating vibration of mechanical equipment, piping and ductwork.
- B. Provide isolators, bases, pads, sleeves, hangers and other devices specified, required, or detailed for the project. Include all vibration isolation system elements as recommended by the equipment manufacturer's representative to ensure a complete, high performing and safe installation. Furnish and install all incidental materials required.
- C. Items included in this section:
 - 1. Flexible duct connectors
 - 2. Flexible pipe connectors
 - 3. Flexible metal hose
 - 4. Inertia bases
 - 5. Vibration isolators

1.3 QUALITY ASSURANCE

- A. Work of this section shall be performed by suppliers and skilled tradesmen who are experienced in vibration control and mitigation to meet the requirements of this Section.
- B. Provide field supervision and inspection to ensure proper installation, adjustment and performance. Replace any isolators that are found to resonate with the supported equipment.
- C. Isolators shall be selected, installed and adjusted to prevent the transmission of objectionable vibration and noise to the building structure.
- D. The size and number of mounts and hangers shall be chosen to meet these specifications, even if not specifically shown on the plans. Brackets, rails, bases, braces, etc., shall be provided as needed for a complete, high performing and safe installation.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device required.
- B. Shop Drawings:
 - 1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
 - 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

- C. Delegated-Design Submittal: For each vibration isolation device.
 - 1. Include design calculations for selecting vibration isolators and for designing vibration isolation bases.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, manufacturers for products specified in this Section shall be one of the following:
 - 1. Vibration Eliminator Co.
 - 2. Mason Industries, Inc.
 - 3. Kinetics Noise Control
 - 4. Vibration Mounting and Controls (VMC)
 - 5. Korfund
 - 6. Vibration Isolation Co.
 - 7. Amber Booth

2.2 FLEXIBLE DUCT CONNECTORS

- A. Flexible sleeves for duct connections shall be fabricated from flexible, airtight, coated fabric. Each sleeve shall be at least 7 inches long and installed with at least 3 inches slack across a clear metal to metal gap of at least 4 inches.

2.3 FLEXIBLE METAL HOSE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Metraflex
 - 2. Flex Hose Co.
 - 3. Flexonics
 - 4. Mason Industries Inc.
 - 5. Anaconda
- B. Provide metal hoses with length and end fittings as shown on drawings, with an inner corrugated hose made of type 304, 321, or 316 stainless steel and outer braid made of 304 stainless steel.
- C. For copper piping systems, use copper construction braided hoses.

2.4 FLEXIBLE PIPE CONNECTORS (RUBBER)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mason Industries Inc. Type SFDEJ
 - 2. Metraflex Type DS
- B. Flexible connectors with neoprene and nylon type elements, with carbon steel or ductile iron floating flanges. Rated for 150 psig working pressure at 200°F, with peroxide cured EPDM liner and cover, ultraviolet resistant, hand wrapped, non-molded, multiple arch body, with control rods or cables.

2.5 INERTIA BASES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mason Industries, Inc.: Basis of design models noted below. Refer to Article 2.1 for approved equal manufacturers.
 - a. Type A: Model WFSL with unhoued spring isolators.
 - b. Type B: Model BMK/KSL with unhoued spring isolators.
- B. All mounts shall have leveling bolts rigidly secured to the equipment being isolated.
- C. Base Type A – Steel Inertia Base:
 1. Shall be a structural steel base frame with clearance holes located to correspond to the mounting bolt holes of the equipment mounted on the base.
 2. Bases shall have built-in motor slide rails and shall be reinforced as necessary to withstand belt pull without drive misalignment or base distortion. The bases shall be constructed with deep angle steel sections with a minimum vertical angle leg of 4 inches for motors of 7.5 hp or less, 5 inches for motors between 7.5 hp and 20 hp and 6 inches for motors over 20 hp.
- D. Base Type B – Concrete Inertia Base:
 1. Shall have an integral rectangular structural steel form into which concrete is poured. Perimeter members shall be beams of depth equal to 10% of the longest span of the base, but not more than 12 inches nor less than 6 inches deep. Forms shall include motor slide base and all reinforcing steel. Where anchor bolt locations fall in concrete, the reinforcing steel shall include drilled members with sleeves welded below the steel to accept the anchor bolts. Height saving steel brackets shall be used in all mounting locations.
 2. When the concrete base in “T” shaped, isolators shall be located under the projections as well as under the main body in order to prevent cantilever distortion.

2.6 VIBRATION ISOLATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Mason Industries, Inc.: Basis of design models noted below. Refer to Article 2.1 for approved equal manufacturers.
 - a. Mounts:
 - 1) Type 1: Model MSW
 - 2) Type 2: Model ND
 - 3) Type 3: Model SLF
 - b. Hangers:
 - 1) Type 1: Model HD
 - 2) Type 2: Model 30N
- B. Isolator Mounts:
 1. Type 1:
 - a. Waffle Pads shall be 3/8-inch-thick neoprene pads ribbed or waffled on both sides. The pads shall be manufactured with quality neoprene and selected for a maximum durometer of 50 and designed for 15% strain. Where required, steel load-spreading plates shall be incorporated between the equipment and the neoprene pad.
 - b. If the isolator is bolted to the structure, a neoprene mounting sleeve shall be installed under the bolt head between the steel washer and the base plate.

2. Type 2:

- a. Shall be laterally stable, double deflecting, molded neoprene isolators. All metal surfaces shall be covered with neoprene. The top and bottom surfaces shall be ribbed and bolt holes shall be provided in the base. The mounts shall have leveling bolts rigidly secured to the equipment.
- b. The isolator shall be manufactured with bridge bearing quality neoprene and selected for a maximum durometer of 50 and designed for 15% strain. DDNM mounts shall be selected for a static deflection of 3/8 inch unless otherwise specified.

3. Type 3:

- a. Shall have a free-standing and laterally stable steel spring without any housing. Springs shall be designed so that the ratio of the horizontal to vertical spring constant is between one and two. The spring diameter shall be not less than 80% of the compressed height of the spring at rated load. Loaded springs shall have a minimum additional travel to solid equal to 50% of the specified static deflection.
- b. Unless otherwise specified, the minimum static deflection of Type 3 isolators for equipment mounted on grade slabs shall be 1 inch and for the minimum static deflection for equipment mounted above grade level shall be 2 inches.
- c. Two Type 3 isolation pads sandwiching a 16 gauge stainless or galvanized steel separator plate shall be bounded to the isolator baseplate.
- d. Unless otherwise specified, isolators need not be bolted to the floor for indoor installations. If the base plates are bolted to the structure, a neoprene mounting sleeve shall be installed under the bolt head between the steel washer and the base plate.

4. Type 4:

- a. Laterally stable, restrained spring type with housings and heavy top plates for supporting the equipment and resisting seismic and wind loading. Spring isolators shall be comprised of two interfacing but independent elements; a coil spring element and a seismically rated housing. Housings and springs shall be powder coated and hardware galvanized. The spring coil element shall be comprised of one or more coil assemblies having all of the characteristics of freestanding coil spring isolators.
- b. The seismically rated housing shall be sized to meet or exceed the force requirements applicable to the project and have the capability of accepting coils of various sizes, capacities, and deflections as required to meet the desired isolation criteria. All spring forces will be contained within the coil/housing assembly and under no seismic load condition shall the restraint anchoring hardware be exposed to spring generated forces. Top plate and restraining bolts shall be out of contact with the housing during normal operation.
- c. The restraint element shall incorporate a steel housing with elastomeric elements at all dynamic contact points. The restraint will allow a maximum of 1/4 in. (25 mm) motion in any direction from the neutral position. All elastomeric elements shall be replaceable.
- d. The leveling nut or screw shall be accessible for adjustment with the use of a pneumatic or electric impact wrench. The spring element shall be replaceable without having to lift or otherwise remove the supported equipment.

C. Isolator Hangers:

1. Type 1:

- a. Double Deflection Low Dynamic Stiffness Hangers shall consist of a molded low dynamic stiffness (LDS) isolating element in a steel hanger box. A LDS sleeve shall be provided where the lower hanger rod passes through the steel hanger box, such that the hanger rod cannot contact the steel hanger. The diameter of the clear hole in the hanger box shall be at least 3/4 inch larger than the diameter of the hanger rod and permit the hanger rod to

swing through a 30° arc. When installed, the hanger box shall be allowed to rotate through a full 360° without encountering any obstructions.

- b. The isolator shall be manufactured with quality LDS and selected for a maximum durometer of 50 and designed for 15% strain. Unless otherwise specified, the static deflection of Type 2 hangers shall be minimum of 0.3 inches.

2. Type 2:

- a. Spring and Low Dynamic Stiffness Hangers shall consist of a steel spring in a series with a low dynamic stiffness (LDS) isolating element. The spring shall have a minimum additional travel to solid equal to 50% of the specified deflection. The neoprene element shall have a static deflection of not less than 0.3 inches with a strain not exceeding 15%.
- b. Unless otherwise specified, the static deflection of SPH hangers shall be 2 inches.
- c. Spring diameter and hanger box hole size shall be large enough to permit the hanger rod to swing through a 30° arc. A neoprene sleeve shall be provided where the lower hanger rod passes through the steel hanger box, such that the hanger rod cannot contact the steel hanger. The diameter of the clear hole in the hanger box shall be at least 3/4 inch larger than the diameter of the hanger rod. When installed the spring element shall not be cocked and the hanger box shall be allowed to rotate through a full 360° arc without encountering any obstructions.

PART 3 - EXECUTION

3.1 GENERAL

- A. All equipment mounted on vibration isolators shall have a minimum operating clearance of 1 inch between the bottom of the equipment or inertia base and the concrete housekeeping pad (or bolt heads) beneath the equipment.
- B. Provide a minimum of 4 inches between isolated equipment and the walls, ceiling, floors, columns and any other equipment not installed on vibration isolators.
- C. Piping, ductwork, conduit or mechanical equipment shall not be hung from or supported on other equipment, pipes, or ductwork installed on vibration isolators.
- D. Vibration isolator sizes and layout shall be determined by the vibration isolator supplier
- E. Equipment connected to water or other fluid piping shall be erected on isolators or isolated foundations at correct operating heights prior to connection of piping. Equipment should be blocked-up with temporary shims to final operating height. When the system is assembled and fluid is added, the isolators shall be adjusted to allow removal of the shims.
- F. All mechanical equipment not specifically identified in this specification that contains rotating or vibrating elements shall be installed on Mount Type 2 neoprene isolators as appropriate. Provide supporting steel structure between isolators and equipment if isolator does not readily connect to equipment.
- G. All equipment and their respective isolators shall be directly mounted on primary steel. Units and isolators shall not be mounted on resiliently supported steel cabinets or plenum floors or other flexible construction.
- H. Roof mounted fans or roof top units shall be installed on a curb mounted base.
- I. All wiring connections to mechanical equipment on vibration isolators (either spring or neoprene type) shall be made with a minimum 36-inch-long flexible conduit. Coordinate wiring connections with the Electrical Installer.

3.2 APPLICATION TABLES

Floor Mounted Equipment Type	Slab on Grade		Floor Span Up to 30 Feet		Floor Span 30 to 40 Feet	
	Base Type	Isolator Type	Base Type	Isolator Type	Base Type	Isolator Type
Chillers:						
Water Cooled Reciprocating	None	Mount 1	None	Mount 1	None	Mount 1
Water Cooled Centrifugal	None	Mount 1	None	Mount 4	None	Mount 4
Absorption	None	Mount 1	None	Mount 1	None	Mount 1
Cooling Towers:						
All	None	Mount 1	None	Mount 4	None	Mount 4
Air Compressors:						
Tank Mounted - Horizontal <20 HP	None	Mount 3	None	Mount 3	None	Mount 3
All Others	B	Mount 3	B	Mount 3	B	Mount 3
Pumps:						
Base Mounted < 7.5 HP	None	Mount 3	B	Mount 3	B	Mount 3
All Others	None	Mount 3	B	Mount 3	B	Mount 3
Fans:						
< 22" diameter	None	Mount 2	None	Mount 3	B	Mount 3
> 22" diameter and < 2" SP	A	Mount 3	B	Mount 3	B	Mount 3
> 22" diameter and > 2" SP	B	Mount 2	B	Mount 3	B	Mount 3
Rooftop Unit:						
All	Curb	Mount 1	Curb	Mount 1	Curb	Mount 1
Computer Room Units:						
All	None	Mount 3	None	Mount 3	None	Mount 3
Generators:						
All	None	Mount 3	B	Mount 3	B	Mount 3

"Floor Span": Defined as the distance between centers of floor joists.

B. Suspended Equipment:

Equipment Type	Isolator Type
Pumps:	
Inline Pumps < 5 HP	Hanger 2
Fans (including Fan Coil Unit and Heat Pumps:	
< 22" diameter	Hanger 1
> 22" diameter and < 2" SP	Hanger 2
> 22" diameter and > 2" SP	Hanger 2

"Floor Span": Defined as the distance between centers of floor joists.

3.3 BASE MOUNTED PUMPS

- A. Any rigid pipe elbows at the pump suction and discharge connections shall be supported from the inertia base. All pipe connections shall be with a flexible pipe connector.

3.4 FAN ISOLATION - GENERAL

- A. All fan bases and isolators shall be sized so that thrust restraints (which would act against turning moment caused by static pressure) are not required.

3.5 PIPES WITH MULTIPLE CONNECTIONS

- A. Where a pipe run connects multiple items of equipment in the Mechanical Room the pipe hanger isolators for the entire run shall be chosen to suit the connected equipment of greatest static deflection.

END OF SECTION 20 0548

SECTION 26 5568 - EXTERIOR ATHLETIC LIGHTING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- A. 29 CFR 1910 - Occupational Safety and Health Standards.
- B. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
- C. ASCE 7-10 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- F. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- H. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- I. BS EN 40-3-1 - Lighting Columns - Design and Verification. Specification for Characteristic Loads.
- J. BS EN 62305 - Protection Against Lightning.
- K. ICC (IBC) - International Building Code.
- L. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.
- M. IES LM-5 - IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations.
- N. IES RP-6 - Recommended Practice: Lighting Sports and Recreational Areas.
- O. ISO 1461 - Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods.
- P. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- Q. NFPA 780 - Standard for the Installation of Lightning Protection Systems.
- R. UL 96 - Lightning Protection Components.
- S. UL 96A - Standard for Installation Requirements for Lightning Protection Systems.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Scope:
 - 1. Design, provide and install a complete exterior athletic lighting system meeting the requirements of IESNA, the drawings and this performance specification. This includes but is not limited to:
 - a. All electrical distribution, controls, and monitoring equipment from the exterior athletic lighting source feeder to the utilization equipment.

- b. Poles and Foundations.
 - c. LED Luminaires and all associated mounting equipment.
 - d. Delegated Design and Engineering required for this system. This includes additional soil borings required for pole foundation design.
- B. Section includes lighting for the following outdoor sports venues:
 1. Main Field: Football (360' x 160') & Soccer (360' x ~~195'~~190')
 2. Auxiliary Field : Football (360' x 160') & Soccer (360' x ~~240'~~210')
 3. Band Practice Field: (~~240'~~216'x~~193'~~192')
- C. Related Sections:
 1. Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables (0-1,000V)"
 2. Section 26 0533 "Raceways and Boxes for Electrical Systems"
 3. Section 26 0553 "Identification for Electrical Systems"
- D. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- E. The purpose of these specifications is to define the lighting system performance and design standards for Northview High School Athletic Complex using an LED source. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.
- F. The primary goals of this sports lighting project are:
 1. Guaranteed Light Levels: Selection of appropriate light levels impacts the safety of players and the enjoyment of spectators. Therefore, light levels are guaranteed to not drop below specified target values for a period of 25 years.
 2. Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to players, spectators, and neighbors.
 3. Cost of Ownership: To reduce the operating budget, the preferred lighting system shall be energy-efficient and cost-effective to operate. All maintenance costs shall be eliminated for the duration of the warranty.
 4. Control and Monitoring - To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.
 - a. Base Bid: Standard LED Field Lighting
 - b. Accent Lighting (Main Field Only): To allow for custom lighting effects, including team colors, lighting for special occasions, and theatrical effects, all poles should be equipped with RGB accent luminaires to illuminate the structures in various custom colors. Colors should be selectable via an onsite device.
 - c. Alternate No. 6 - Field Lighting
 - 1) Base Bid: Standard LED Field Lighting
 - 2) Alternate: Add all work indicated on Drawings and in this Specification labeled as "Alternate No. 6". Add Showlight Entertainment Features Package. Entertainment Features (Main Field & Auxiliary Field): Control system shall incorporate pre-programmed light shows such as "chase", "wave", "Marquee", and "Random". Control system shall incorporate the ability to initiate these shows locally. System shall be able to synchronize light shows to customer-supplied music.
 - d. Alternate No. 7 - Field Lighting
 - 1) Base Bid: Standard LED Field Lighting
 - 2) Alternate: Add all work indicated on Drawings and in this Specification labeled as "Alternate No. 7". Add Light Pole Color Package on the Main Competition Field Only. Must include the Showlight Entertainment Features Package. All poles should be equipped with RGB accent luminaires to illuminate the structures in various custom

colors. Colors should be selectable via an onsite device. Accent Lighting to allow for custom lighting effects and including team colors.

- e. Alternate No. 8 - Field Lighting
 - 1) Base Bid: Standard LeD Field Lighting
 - 2) Alternate: Add all work indicated on Drawings and in this Specification labeled as "Alternate No. 8". Add Full Field package on the Main Competition Field Only. Must include the Showlight Entertainment Features Package. Accent Lighting to allow for custom lighting effects, including team colors, lighting for special occasions, and theatrical effects, all poles should be equipped with RGB accent luminaires to illuminate the field in various custom colors. Colors should be selectable via an onsite device.

1.4 DEFINITIONS

- A. 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.
- B. Fixture: See "Luminaire."
- C. 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 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.
- D. LC: Lighting Certified by the NCQLP.
- E. 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.
- F. 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."
- G. Pole: Luminaire support structure, including tower used for large area illumination.
- H. 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.

1.5 SUBMITTALS

- A. Product Data: For each type of luminaire, luminaire support structures, lighting controls and distribution equipment products.
 - 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. Performance 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. Drawings and specifications for construction of lighting system.
 2. Manufacturer's determination of LLF used in design calculations.
 3. 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.
 4. 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.
 5. Wiring requirements, including required conductors, cables, and wiring methods.
 - a. Provide complete project specific wiring diagram showing point of electrical service and all controls, monitoring and power equipment to utilization equipment. This includes, but is not limited to contactor cabinets, power supplies\cabinets, control transformers and power supplies.
 6. Structural analysis data, calculations and details used for pole selection and foundation design.
 - a. Pole Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required.
 7. Manufacturer Wind-Load Strength Certification: Submit certification that selected total support system, including poles, fixtures and foundations, complies with AASHTO LTS for location of Project.
- C. Field quality-control reports.
- D. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires to include in operation and controls equipment maintenance manuals.
- B. Light Level Verification Field Measurements: Provide documentation of field measurement of as-built condition lighting levels in all areas included within the performance requirements.

1.7 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: Luminaire manufacturers' laboratory accredited under the NVLAP for Energy Efficient Lighting Products.
- D. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.
- 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 with the experience and capability to conduct field testing according to IES LM-5.
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.2/D1.2M.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of luminaires, lamps, controls and distribution equipment 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.
- B. Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term.
- C. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of substantial completion. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance.
- D. Warranty Period: Twenty-five (25) years from date of Substantial Completion.

1.10 ONFIELD LIGHTING PERFORMANCE

- A. Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting manufacturers will provide a guarantee that light levels will be sustained over the life of the warranty period. Lighting calculations shall be developed, and field measurements taken on the grid spacing with minimum number of grid points specified below. Manufacturers will provide lumen maintenance data of the LED luminaires used per TM-21-11

and will incorporate the lumen maintenance projections into the lighting designs to ensure target light levels are achieved throughout the guaranteed period of the system. Per IES guidelines, lumen maintenance hours should be reported based on the 6x multiplier of testing hours.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Main Field (Football)	50FC	2:1	72	30' X 30'
Main Field (Soccer)	50FC	2:1	84	30' X 30'
Auxiliary Field (Football)	50FC	2:1	72	30' X 30'
Auxiliary Field (Soccer)	50FC	2:1	9684	30' X 30'
Band Practice Field	30FC	5:1	11099	20' X 20'

- B. Color Temperature: The lighting system shall have a minimum color temperature of 5,700K and a CRI of 75.
- C. Playability: Lighting design and luminaire selection should be optimized for playability by reducing on-field glare and providing sufficient uplight.
1. Aiming Angles: To reduce glare, luminaire aiming should ensure the top of the luminaire field angle (based on sample photometric reports) is a minimum of 10 degrees below horizontal.
 2. Glare Control Technology: Luminaires selected should have glare control technology including, but not limited to: external visors, internal shields and louvers.
 3. Beam Restriction: No symmetrical beam patterns are acceptable.
 4. Aerial lighting - Adequate illumination must be provided above the field to see the ball in flight. It is recommended that a lighting analysis be performed above the field of play to evaluate the visibility of the ball over its typical trajectory to ensure the participants will adequately see the ball. Calculation planes should be evaluated up to the maximum anticipated height for the level of play.
 5. Mounting Heights: To ensure proper aiming angle, minimum mounting heights shall be as described below. Higher mounting heights may be necessary for luminaires with lesser glare control to meet field angle requirements above.

Main Field		
# of Poles	Pole Designation	Pole Height
2	F1 & F2	90'
2	F3 & F4	80'
Auxiliary Field		
# of Poles	Pole Designation	Pole Height
2	F1 & F2	90"
2	F5 & F6	80"
Band Practice Field		
# of Poles	Pole Designation	Pole Height
2	P1 & P2	70'

6. Poles F1 & F2 are shared between the main field and the auxiliary field.
- D. Alternates No. 7 and No. 8. RGB fixtures shall have a minimum lumen output as follows: Green - 16,000 lumens per fixture, Red - 8,000 lumens per fixture, Blue - 6,000 lumens per fixture.

1.11 ENVIRONMENTAL LIGHT CONTROL

- A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers, and external shields. No symmetrical beam patterns are accepted.

- B. Spill Light and Glare Control: To minimize impact on adjacent properties, spill light and candela values must not exceed the following levels taken at 3 ft above grade.

Spill & Glare at 150'	Maximum
Horizontal Footcandles (Taken at 3' AFG)	0.30 FC
Vertical Footcandles (Taken at 5' AFG)	~~0.70~~ <u>0.50</u> FC
Candela (Taken at 5' AFG)	~~12,000.00~~ <u>10,000</u> CD

- C. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be provided in 30-foot intervals along the boundary line at 3 ft above grade.
- D. Sample Photometry: The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testign laboratory with a minimum of five years of experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.
- E. Field Verificatoin: Lighting manufacturer shall supply field verification of environmental light control using a meter calibrated within the last 12 months.
1. Spill verification: Illumination levels shall be taken in accordance with IESNA RP-6-22. The light sensing surface of the light meter should be held 36 inches above the playing surface with the sensing surface horizontal (for horizontal readings) or vertically pointed at the brightest light bank (for max vertical readings).

1.12 COST OF OWNERSHIP

- A. Manufacturer shall submit a 25-year Cost of Ownership summary that includes energy consumption, anticipated maintenance costs, and control costs. All costs associated with faulty luminaire replacement - equipment rentals, removal and installation labor, and shipping - are to be included in the maintenance costs.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Musko Lighting (Basis of Design)
- B. Ephesus Sports Lighting (Engineer approved submittal required)
- C. Wil Lighting (Engineer approved submittal required)

2.2 PERFORMANCE REQUIREMENTS

- A. Facility Type: High school.
- B. Illumination Criteria:
1. Minimum average target illuminance level for each lighted area for each sports venue and for the indicated class of play according to IES RP-6.
 2. CV and maximum-to-minimum uniformity ratios for each lighted area equal to or less than those listed in IES RP-6 for the indicated class of play.
 3. UG levels within each lighted area equal to or less than those listed in IES RP-6 for the indicated speed of sport.
- C. Illumination Criteria:
1. Minimum Average Target Illumination: Per IES RP-6, based on class of play.
 2. Maximum-to-Minimum Uniformity Ratio: Per IES RP-6, based on class of play.

- D. 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 authorities having jurisdiction.
 - 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 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 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 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 above finished grade from designated "spill-light critical" areas to be less than 12,000 candela when so observed.
 - 4. Determine LLF according to IES RP-6 and manufacturer's test data.
 - a. Use LLD at 100 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 70 percent and may be lower when determined by manufacturer after application of the ballast output and optical system output according to 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.
- E. Football Fields:
 - 1. IES RP-6: Class of Play I.
 - 2. Speed of Sport: Fast.
 - 3. Grid Pattern Dimensions: 30 by 30 feet.
- F. Soccer Fields:
 - 1. IES RP-6: Class of Play I.
 - 2. Speed of Sport: Fast.
 - 3. Grid Pattern Dimensions: 30 by 30 feet.
- G. Lacrosse Fields:
 - 1. IESNA RP-6: Class of Play I.
 - 2. Speed of Sport: Fast.
 - 3. Grid Pattern Dimensions: 30 by 30 feet..
- H. Lighting Control:
 - 1. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.
 - 2. Lighting contactor cabinet(s) shall be NEMA Type 4 aluminum, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.

3. Contractor control of lights: Circuits must be controlled via contractor switching, not dimming driver output to zero.
 4. Dimming: System shall provide for 4-stage dimming (high-medium-low- blackout). Dimming will be set via scheduling options (Website, app, phone, fax, email) or via an onsite use interface tablet or device.
 5. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.
 6. The system shall be capable of various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute "early off" commands by phone. Scheduling tool shall be capable of setting curfew limits.
 7. Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.
 8. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).
 9. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS and Android devices.
 10. Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the owner.
 - a. Cumulative hours: shall be tracked to show the total hours used by the facility
 - b. Report hours saved by using early off and push buttons by users.
 11. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.
 12. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.
 13. Entertainment Features Main Competition Field (Alternate No. 6): Control System shall store four (4) standard preprogrammed lighting effects with option for two (2) custom preprogrammed lighting scenes or effects. Programming will additionally include (4) minutes of custom programming with lights synchronized to music supplied by customer. Shows shall be initiated by a manufacturer provided touchscreen user interface on the control system network.
- I. Electric Power Distribution Requirements:
1. Electric Power Requirements:
 - a. Electric Power: 480 volt, 3 phase.
 - b. Maximum Total Voltage Drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.
 2. Energy Consumption: ~~The kW consumption for all the field lighting systems (Main, Auxiliary, and Band) shall be 141 kW. The kW consumption for the field lighting system shall be less than 129 kW - 60 kW (Main Field), 52 kW (Auxiliary Field), and 17kW (Band Practice Field).~~
 3. Circuits: Homerun all circuits to poles. Do not create underground wiring connections.
 4. In ground pull box requirements: Only 12 in deep (minimum) concrete polymer underground hand holes and lids are allowed. Place on top of 12 in compacted 3/4 in aggregate rock. Lids must be marked with "LIGHTING". Steel lids are not allowed. Do not create underground wiring connections in pull box.
- J. Structural Design Parameters
1. Wind Loads: Wind loads shall be based on the 2021 ICC (IBC). Wind loads to be calculated using ASCE 7-16, an ultimate design wind speed of 110 and exposure category C.

2. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to AASHTO LTS.
3. Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report. If no geotechnical report is available, the foundation design shall be based on soils that meet or exceed those of a Class 5 material as defined by 2021 IBC Table 1806.2.
4. 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. These drawings must be submitted at time of bid to allow for accurate pricing.

2.3 OUTDOOR SPORTS LIGHTING SYSTEM

- A. Components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.
- B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123/A123M. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153/A153M and ISO 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.
- C. System Description: Exterior Athletic Lighting System shall consist of the following:
 1. Galvanized steel luminaire poles shall be high-strength, low alloy tapered round poles hot-dip galvanized inside and outside after fabrication in accordance with ASTM A123/A123M and ISO 1461. They shall conform to AASHTO stress standards and BS EN 40-3-1. Non-acceptable pole systems include square static cast concrete poles and direct-bury steel poles. Features shall include:
 - a. Built in hardware for electrical component installation.
 - b. Internal wire access.
 - c. Pole ID Label.
 - d. Copper grounding lug.
 - e. Stainless steel fasteners.
 - f. Factory assembled cross-arm assembly manufactured of same components.
 2. Poles shall be installed on a precast steel reinforced concrete foundation set directly into the ground, with concrete backfill. The foundation shall be constructed of air-entrained concrete and have a minimum compressive design strength at 28-days of 3,000 PSI and meet requirements of applicable ASTM standards. All piers and concrete backfill must bear on and against firm undisturbed soil. Features shall include:
 - a. Access Holes for wire entry.
 - b. Epoxy coating on ends to prevent water intrusion.
 - c. Integral lifting holes and associated lifting rods for installation.
 - d. Integrated lightning ground system compliant with NFPA 780, UL 96A and BS EN 62305 EN 62305.
 - 1) Tested to 100KA by NRTL.
 - 2) 2/0 AWG Grounding electrode conductor.
 - 3) 20'-0" Concrete encased grounding electrode.
 - e. For anchor bolt foundations or foundations using a pre-stressed concrete base in suspended pier or re-enforced pier, design pole erection may occur after 7 days. Or after a concrete sample from the same batch achieves a certain strength.
 3. Manufacturer will supply all drivers and supporting electrical equipment

- a. Remote drivers and supporting electrical equipment shall be mounted on the pole assembly, approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure. Integral drivers are not allowed.
 - b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2.
 - 4. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
 - 5. All luminaires, visors, and cross-arm assemblies shall withstand 150 mi/h winds and maintain luminaire aiming alignment.
 - 6. Control cabinet to provide remote on-off control and monitoring.
 - 7. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
 - a. Integrated grounding via concrete encased electrode grounding system.
 - b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.
- D. Safety: All system components shall be UL listed for the appropriate application

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire electrical 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.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. 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 26 0519 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 0533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.
- C. Coordination layout and installation of luminaires with other construction.
- D. Use web fabric slings (not chain or cable) to raise and set structural members. Protect equipment during installation to prevent corrosion.
- E. Install poles and other structural units level, plumb, and square.
- F. Install luminaires at height and aiming angle as indicated on Drawings.

- G. 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 05 5000 "Metal Fabrications."
 - 1. Extend cast-in-place bolted base foundations 36 inches above grade, minimum.
- H. Install protective pipe bollards on two sides of each embedded pole installed in paved areas. See Section 05 5000 "Metal Fabrications" for pipe bollards.
- I. Install controls and ballast housings in cabinets mounted on support structure at least 10 feet above finished grade.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. 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.
 - a. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-22.
 - 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:
 - a. Football Fields: Lighted area is 160 by 360 . Measure at least 72 points.
 - b. Soccer Fields: Lighted area is 240 by 360. Measure at least 96 points.
 - c. Band Practice Field: Lighted area is 210 by 193. Measure at least 110 points.
 - d. All Other Non-Field Areas: Take spot measurements at key areas approximately 30 feet apart.
 - 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.
 - 5. Field Light Level Accountability
 - a. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 years. These levels will be specifically stated as "guaranteed" on the illumination summary provided by the manufacturer.
 - b. The contractor/manufacturer shall be responsible for conducting initial light level testing and an additional inspection of the system, in the presence of the owner, one year from the date of commissioning of the lighting.
- C. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs
- D. 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 5 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.
- E. 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.
- F. Sports lighting will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

3.5 WARRANTY AND GUARANTEE

- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather condition events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.
- B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance. Owner agrees to check fuses in the event of a luminaire outage.

3.6 ADJUSTING

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

END OF SECTION 26 5568

SECTION 27 5119 - FIELD UTILITY BOXES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This section includes the following:
 - 1. Furnish all labor, materials, and equipment necessary to install pre-manufactured track surfacing or synthetic turf field utility boxes.
- B. Related Sections include the following:
 - 1. Specification Section 32 1818 Synthetic Turf.
 - 2. Division 26 - Electrical.
 - 3. Division 27 - Communications.

1.3 QUALITY ASSURANCE

- A. Warranty Guarantee:
 - 1. The completed system shall be guaranteed to be free from all defects for a period of one (1) year from the date of final acceptance, or the manufacturer's specific warranty related to the product or service, whichever is greater. Any defects or system malfunctions identified shall be immediately corrected at no cost to the Owner for the warranty/guarantee period.

1.4 SUBMITTALS

- A. Manufacturer's Product Data:
 - 1. Provide manufacturers product data prior to actual field installation work.
- B. Shop Drawings:
 - 1. Provide shop drawings of the manufacturer's recommended installation and foundation requirements (if required) prior to actual field installation work. Shop drawings shall include a utility box layout drawing if required.

1.5 PRODUCT DELIVERY AND STORAGE

- A. Materials delivered to the site shall be examined for damage or defects in shipping. Any defects shall be noted and reported to the Owner's representative. Replacements, if necessary, shall be immediately re-ordered. Sound materials shall be stored above ground under protective cover or indoors for proper protection.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Furnish and install synthetic turf utility boxes as detailed.
- B. Track Surface Utility boxes shall be from one of the following (or approved equal)

Sportsfield Specialties:	Model CBTS 1830 (18"x30")
SportsEdge:	Model SEF910 (18"x30")
Gill Athletics:	Model F910 (18"x30")

- C. Synthetic Turf Surface Utility boxes shall be from one of the following (or approved equal)

Sportsfield Specialties:	Model CBIT 1830 (18"x30") Model GPAFITC (1'-10" x 1'-10", 8" box ht.) Model GPAFITRC (2'-8" x 2'-8", 12" box ht.)
SportsEdge:	Model SEF900 (18"x30")
Gill Athletics:	Model F960 (18"x30")

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install equipment in accordance with manufacturer's written instructions and as indicated on the drawings.
1. For a Synthetic Turf Installation, the utility access box shall abut the concrete curb unless noted otherwise on the drawings.
- B. Contractor is responsible to confirm the exact locations of the proposed boxes with Architect or Electrical Engineer prior to installation.
- C. Field install synthetic turf surfacing.

END OF SECTION 27 5119

SECTION 32 1818 - SYNTHETIC TURF - BLEND

PART 1 GENERAL

1.1 SUMMARY

- A. This Section is a part of the entire set of Contract Documents, including General and Supplementary Conditions. Drawings shall be coordinated with the applicable provisions of the other parts.
- B. Related Sections:
 - 1. Section 32 1123 Aggregate Drainage Layer.
 - 2. Section 32 1852 Performance Shock Pad.

1.2 SCOPE OF WORK

- A. The work under this section includes the following:
 - 1. Furnish all labor, materials and equipment, necessary for the complete installation of a multi-purpose synthetic turf system.
 - 2. Procure and install infill material.
 - 3. Pre and Post Installation Testing.
 - 4. Warranty Guarantees.
 - 5. Maintenance Equipment.
 - 6. Installation of synthetic grass surfacing system shall include all incidental work required to complete the work described herein, as shown on the Drawings, and included in related Specifications.
 - 7. Attic Stock.

1.3 REFERENCES

- A. Reference herein to any technical society, organization, group, or regulation are made in accordance with the following abbreviations, and unless noted or specified otherwise, all work under this Section shall conform to the latest edition as applicable.

B. American Society for Testing and Materials (ASTM):

D418	Standard Test Method for Testing Pile Yarn Floor Covering Construction
D789	Yarn Melting Point
D1335	Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
D1577	Standard Test Method for Linear Density of Textile Fiber
D1682	Standard Method of Test for Breaking Load and Elongation of Textile Fabrics
D2256	Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method (breaking Strength and Elongation)
D2859	Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
D3218	Standard Test for Fiber Thickness (Microns)
D4491	Water Permeability of Geotextiles by Permittivity
D5034	Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
D5035	Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
D5848	Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering
F355	Standard Test Method for Impact Attenuation of Playing Surface Systems and Materials
F1015	Standard Test Method for Relative Abrasiveness of Synthetic Turf Playing Surfaces
F1551	Comprehensive Characterization of Synthetic Turf Playing Surfaces and Materials
F1936	Standard Specification for Impact Attenuation of Turf Playing Systems as Measured in the Field
F2117	Standard Test Method for Vertical Rebound Characteristics of Sports Surface/Ball Systems; Acoustical Measurement
F2765	Standard Specification for Total Lead Content in Synthetic Grass Fibers

C. Federation Internationale de Football Association (FIFA)

FIFA 09/EN 13672	Simulated Wear/Abrasion Resistance
EN ISO 20105-A02	Artificial Weathering (3,000 hours UVA)
EN 13864	Artificial Weathering (3,000 hours UVA) Pile Yarn Tensile Strength

D. National Collegiate Athletic Association (NCAA).

E. National Federation of State High School Associations (NFHS).

F. Michigan High School Athletic Association (MHSAA).

G. Synthetic Turf Council (STC).

H. American Sports Builders Association (ASBA).

1.4 QUALITY ASSURANCE

- A. In the event conflicts exist between information contained in this Specification and in other parts of the Contract documents, Bidder shall assume that the more stringent and highest performing solution is required.
- B. Following acceptance of bids and evaluation of all product related information submitted with bid and requested additionally, the Owner reserves the right to award based on factors other than low bid.
- C. Manufacturer Qualifications:
 - 1. Have not had a Surety or Bonding Company finish work on any contract within the last five (5) years.
 - 2. Have not been disqualified or barred from performing work for any public Owner or contracting entity.
 - 3. Shall have documented financial strength to fully service and warrant the systems installed. An audited financial statement for the past fiscal year shall be provided upon the request of the Owner or Landscape Architect.
 - 4. Must be a member in good standing of the Synthetic Turf Council (STC) and/or American Sports Builders Association (ASBA). Prospective bidder shall employ one ASBA Synthetic Turf Certified Field Builder.
 - 5. All products and installation methods shall meet or exceed the current guidelines of the NFHS, NCAA, all applicable ASTM State and Federal Standards, and all current guidelines set forth by the Synthetic Turf Council.
 - 6. Prospective bidder must be experienced in the manufacturing of infilled synthetic turf systems. Turf Manufacturer/Installer shall have fifty (50) fields in the last (5) five years of the same synthetic turf system being proposed with the same manufacturer, product and infill proposed for this project. This includes the fiber, backing, the secondary backing and installation method.
 - 7. Product shall meet the following criteria:
 - a. Have a NCAA Division 1 football field installed with parallel slit or monofilament fiber product.
 - b. Have a football field of 85,000 sq. ft. or more of the exact specified material, including the infill material and fiber, in play for at least two years with the same turf manufacturer and company proposed for this field.
 - c. Verification that provider meets these requirements shall be included with Bid.
- D. Installer Qualifications:
 - 1. The Turf Contractor must provide competent workmen skilled in the installation of synthetic turf material, including, but not limited to, gluing or sewing seams, gluing inlays, proper installation of the infill material, and competency in installing performance shock pads (if required). The Installer shall have a representative onsite to certify the installation and warranty compliance.
 - 2. The assigned designated Supervisory Personnel on the project must be certified, in writing by the Turf Manufacturer, as competent in the installation of the proposed material. Should there be a change in the assigned designated Supervisory Personnel, the Owner and/or Landscape Architect shall be notified in writing within 48 hours of change.
 - 3. Supervisory Personnel shall remain onsite at all times during the installation.
 - 4. The installer shall provide documentation for the following: Fifteen (15) reference projects consisting of Synthetic Multi-Sport Grass Fields of 75,000 square-feet or larger within the past three (3) years which details the following criteria:
 - a. Project Name and Location.
 - b. Project Scope.
 - c. Construction timeline.
 - d. Construction Cost.
 - e. Reference name, title, affiliation, and contact information.
- E. Pre-Installation Field Verification:
 - 1. Base Acceptance:

- a. The synthetic turf manufacturer and/or installation contractor shall perform an inspection of the field base onto which the synthetic turf system is to be installed and to examine the finished surface for required compaction, permeability and grade tolerances.
- b. Upon correction of any discrepancies between the required materials, application and tolerance, the Owner's representative shall provide test results for compaction, permeability and planarity that are in compliance with the project plans and specifications. The turf installer shall accept the aggregate stone base via a written certification of acceptance of the base for installation of subsequent layers of the synthetic turf system.
- c. The acceptance of the base construction should be included in the certification for warranty validation.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Properly store all materials in accordance with manufacturer's recommendations.
 1. Deliver products in original, unopened packaging with manufacturer's identification clearly legible. All products shall be received by Contractor.
 2. All materials shall be stored in a location directed by the Owner and acceptable to the Contractor.
 3. Protect materials from puncture, dirt, grease, water, moisture, mechanical abrasion, excessive heat or cold, or other damaging circumstances.
- B. Upon delivery and prior to installation of synthetic turf system and materials, Contractor shall inspect the materials as follows:
 1. For damaged or defective items.
 2. Measure synthetic turf roll lengths, perforations, and uniformity of product and color.
 3. Adhesives and seaming tape shall arrive in sealed dry containers or packaging and shall be kept in adequate temperatures per manufacturers written requirements.
 4. Rubber infill shall arrive in sacks or bags without any tears or loose material. Rubber shall arrive dry and loose: no rubber will be accepted that is bulked or solid.
 5. Sand Infill:
 - a. Bagged Material: shall arrive without any tears and shall be free from contamination of site materials.
 - b. Bulk Material: deliver materials in clean, washed and covered trucks to eliminate contamination during transportation. Onsite stockpiling locations shall be coordinated with the Owner. Stockpile only in areas free of debris and away from drainage routes and structures. Cover all materials with plastic or geotextile if materials are to be stockpiled more than 48 hours.
 6. Any material(s) that does not meet minimum specified criteria is grounds for rejection.
- C. At time of delivery, lot numbers for each carpet roll shall be provided to Construction Manager or Owner's Representative to validate carpet supplied. Lot numbers shall be provided as part of close-out documentation.

1.6 SUBMITTALS

- A. Bid Submittals.
 1. Proposal package shall include the following information to assist in the preliminary review process:
 - a. Manufacturer qualifications/references as noted herein.
 - b. Installer qualifications/references as noted herein.
 - c. Samples of non-infilled turf product for all colors required, minimum 8"x8" in size. Bidders may elect to submit a color roll of standard manufacturer colors with their bid in lieu of individual samples.
 - d. Fiber manufacturer's name, type of fiber and composition of fiber.
 - e. Product being bid meets or exceeds pre-manufacturer testing.

- f. Sample Manufacturer's Warranty and Third-Party Insured Warranty.
 - g. Sample insurance policy for the Third-Party Insured Warranty.
 - 2. The following letters, on the submitting company's letterhead and signed by a company officer, shall be submitted with the Bid:
 - a. A letter confirming that the Bid Documents have been completely reviewed by qualified representatives of the submitting company acknowledging that the materials and system proposed are adequate for the applications shown and will not impact the system warranty.
 - b. The Bidder shall provide written documentation that system for which they are bidding, does not violate any known or pending patents for specified products.
- B. Post-Award Submittals.
 - 1. Shop Drawings - Submit the following for approval:
 - a. Complete scaled and dimensional drawing, in full color, showing all field lines, markings, inlays, and boundaries in specified colors required for project. All markings shall be tufted in the factory or field inlaid, unless noted otherwise. Custom logos can be provided by Landscape Architect in AutoCad format to expedite shop drawing process.
 - b. Roll/seaming layout Plan.
 - c. Details on field construction, noting any details that may deviate from the Drawings or Specifications including, but not limited to: edge detail, goal post detail, covers for access to subsurface structures, etc.
 - 2. Provide certified copies of independent (third-party) laboratory testing reports per section 1.7 Quality Control Testing.
 - 3. Fiber manufacturer's name, type of fiber and composition of fiber.
 - 4. Proposed infill composition, including pounds of sand and pounds of rubber per square foot. Provide (3) one-pound samples of sand and rubber (in separate bags).
 - 5. Rubber, with certification of availability, from supplier guaranteeing product supply reserved for the Northview High School. Certification shall include:
 - a. Type and origin of raw material (certify that it comes from tires).
 - b. Production facility.
 - c. Production method (cryo or ambient).
 - d. Fiber content (%).
 - e. CRI sieve/gradation analysis.
 - f. The provider the of CRI shall provide in writing that they maintain an ongoing Quality Control program meeting all the standards of the STC Guidelines for CRI Used in Synthetic Turf Fields and capable of meeting all the specifications described herein.
 - 6. Maintenance Equipment: Submittals shall include: product data specifications, operational instructions, etc.

1.7 QUALITY CONTROL TESTING

- A. All testing services shall be the responsibility of and paid for by the submitting or awarded Contractor, unless noted otherwise. All testing noted herein shall be performed by a third-party testing agency that is ISO 17025 certified and approved by the Landscape Architect.
- B. Testing by independent laboratory must be for current materials and testing not older than twelve (12) months from project Bid Date.
- C. Any material tested and found non-compliant with the specifications may be rejected. The Contractor shall be required to submit material that is compliant with the specifications.
- D. The Owner, or the Landscape Architect on the Owner's behalf, reserves the right to independently test any material. Any testing performed by the Owner will be at the Owner's expense. The Contractor is responsible to bear the cost of any testing of product found to be non-compliant. Contractor will bear the cost of all retesting as required by the Owner.

- E. Pre-Manufacturing Testing: Contractor shall submit to Landscape Architect a copy of the test results certified by the independent Testing Laboratory prior to manufacturing of the synthetic turf for the project. Testing data required is as follows:

SYNTHETIC GRASS YARN		
Pile Height	ASTM D 5823	± 1/8" of specification
Pile Weight	ASTM D 5848	± 5% of specification
Total Weight	ASTM D 5848	± 5% of specification
Tuft Bind (w/o infill)	ASTM D 1335	> 8 lbs
Melting Point	ASTM D 789	> 235 degrees F
Denier	ASTM D 1907	± 10% of specifications
Pill Burn Test	ASTM D2859	8 Passed / 0 Failed
Microns	ASTM D3218	± 10% of specifications
Breaking Strength (length)	ASTM D 5034	> 283 lbs./ft
Breaking Strength (width)	ASTM D 5034	> 200 lbs./ft
Fiber Abrasiveness Index	ASTM F 1015	< 35
Lead Content	ASTM F 2765-09	< 50 ppm
Artificial Wearing (3,000 hours UVA) Turf Color Change	EN ISO 20105-A02	> Gray Scale 3
Artificial Wearing (3,000 hours UVA) Pile Yarn Tensile Strength	EN 13864	< 50% reduction

SYNTHETIC GRASS BACKING MATERIALS		
Primary Backing Weight	ASTM D 5848	± 2 oz./yd2 of specification
Secondary Backing Weight	ASTM D 5848	± 2 oz./yd2 of specification

SYNTHETIC GRASS INFILL MATERIALS		
Safety of Toys Part 3	EN 71-3	Pass
Safety of Synthetic Turf Infill	ASTM F 3188	Pass
Infill Size Gradation	EN 933	
Infill Bulk Density	EN 1097	
Artificial Weathering (3,000 hours UVA) Infill Color Change	EN ISO 20105-A02	> Gray Scale 3

SYNTHETIC GRASS SYSTEM		
Lisport Simulated Wear	EN 13672	> 50,000 passes without splitting

- F. Post Manufacturing/Pre-Shipment Testing: Contractor shall submit to Landscape Architect a copy of the test results certified by the Independent Testing Laboratory prior to shipping of the synthetic turf product. Any test result not meeting specifications is grounds for rejection of product, in whole or in part. Testing requirements are as follows:
1. Test sample shall be from five random rolls manufactured for this project. Proof of documentation must be provided upon delivery of the carpet to the job site.
 2. Test results to identify manufacturer, date of test(s), lab technician, project, lot number, etc.

SYNTHETIC GRASS SURFACING CARPET		
Tuft Bind (w/o infill)	ASTM D 1335	> 8 lbs
Stitch Gauge	ASTM D 5793	< 1/2"
Pile Height	ASTM D 5823	± 1/8" of specification
Pile Weight	ASTM D 5848	± 5% of specification
Total Weight	ASTM D 5848	± 5% of specification
Perforations	Visual	> 3/16" dia., spaced 4" o.c.
Denier	ASTM D 418 or 1907	± 10% of specification
Primary Backing Weight	ASTM D 5848	± 2 oz./yd ² of specification
Secondary Backing Weight	ASTM D 5848	± 2 oz./yd ² of specification
Breaking Strength (length)	ASTM D 5034	> 283 lbs./ft
Breaking Strength (width)	ASTM D 5034	> 200 lbs./ft
Pill Burn Test	ASTM D2859	8 Passed / 0 Failed
Lead Content	ASTM F 2765-09	< 50 ppm

SYNTHETIC GRASS SURFACING SYSTEM (carpet, infill, and shock pad)		
Water Infiltration Rate	ASTM F 1551	> 16 in./hr.
Infill Depth Measurement	EN 1969	± 10% of specification (1/2" exposed fiber)
Impact Attenuation	ASTM F 1936	< 120 G's w/ pad < 165 G's w/o pad
Impact Attenuation, Head Injury Criteria (HIC)	EN 1177	< 900 @ 1.3m KEEP ONLY WITH PAD

- G. Post Installation Testing: Upon substantial completion, the Contractor shall perform a one-time test of the items listed below. Contractor shall submit to Landscape Architect, a copy of these test results, certified by the independent Testing Agency.
1. Testing shall be completed on-site within five (5) days upon completion of the installation.
 2. Following field testing, it shall be the Contractor's responsibility to correct any part of the system deemed non-compliant with the specifications.

SYNTHETIC GRASS SURFACING SYSTEM (carpet, infill, and shock pad)		
Infill Depth Measurement	EN 1969	± 10% of specification (1/2" exposed fiber)
Impact Attenuation (min. 10 locations)	ASTM F 1936	< 120 G's with pad < 165 G's w/o pad (individual, not average results)
Impact Attenuation, Head Injury Criteria (HIC) (min. 10 locations)	EN 1177	< 900 @ 1.3m (individual, not average results) WITH PAD ONLY

1.8 WARRANTY GUARANTEE

A. Synthetic Turf System Warranty:

1. The Contractor shall be responsible to provide a Pre-Paid and non-prorated Manufacturer/Installer Warranty Guarantee (referred to herein as "Warranty") for the synthetic grass system for a minimum non-prorated period of eight (8) years from the date of Certificate of Substantial Completion. Synthetic grass system refers to synthetic turf materials, infill materials, installation materials and installation workmanship.
2. \$5,000,000.00 per each insured warranty and \$15Million dollar annual aggregate for all warranties issued during each 12-month period of the 8-Year warranty.
3. Infill material shall be warrantied against breakdown of material outside of project specifications and failure to adhere to EN 71-3 and ASTM F3188 Testing Requirements.
4. The Turf Manufacturer's Warranty must be underwritten by a third-party Best "A" Rated (or better) Insurance Carrier listed in the A.M. Best Key Rating Guide. Warranty shall be guaranteed to cover the items set forth in this Specification for the full eight (8) year period.
5. Insured Warranty coverage must be provided in the form of one (1) single policy.
6. Policies that include self-insurance or self-retention clauses shall not be considered.
7. Policy cannot include any form of deductible amount nor should the Owner be responsible for any deductible.
8. A sample policy shall be provided at the time of Bid to prove that policy is in force. A letter from an agent of sample Certificate of Insurance will not be acceptable.
9. The artificial grass field turf must maintain an ASTM 1936 G-max between 110-165 for the life of the Warranty.
10. The artificial grass field turf with performance shock pad must maintain an ASTM 1936 G-max between 80 - 165 for the life of the Warranty.
11. Refer to Specification Section 321852 for warranty requirements specific to the Proposed Performance Shock Pad.

B. Warranty Requirements:

1. The materials utilized in the synthetic turf system shall be guaranteed for the designated usage:
 - a. Football, Rugby, Soccer, Baseball, Softball, Lacrosse, Field Hockey.
 - b. Marching Band.
 - c. Physical Education and Intramural Sports Programs.
 - d. Physical Education exercises and other similar uses.
 - e. Pedestrian traffic.

- f. Pneumatic rubber-tired maintenance and service equipment, designated for use on athletic fields and golf courses.
 - g. Shot put and discus throwing events compliant with manufacturer recommendations.
 - h. Graduations and Ceremonies compliant with manufacturer recommended floor protection.
 - 2. Warranty Coverage on Materials:
 - a. General wear and damage caused from UV degradation or fiber failure.
 - 1) The term “not fade” in the context of this warranty shall mean that the synthetic grass material remain a uniform shade of green or the other colors installed with no significant loss of color as defined by not greater than 20% loss or shade reduction.
 - b. Excessive fiber wear weathering.
 - 1) The term “not fail” or “excessive wear” as used in the context of this warranty shall mean that the length and weight of the face yarn or pile material in the synthetic grass surface shall not have been decreased by more than 6% per year according to ASTM D418, nor exceed 20% during the warranty period.
 - c. Wrinkling, bubbling, panel movement, or panel shrinkage.
 - d. Tearing.
 - e. Seam integrity.
 - f. Drainage (of Carpet and Infill only).
 - g. Flammability.
 - 3. Warranty Coverage on Workmanship:
 - a. Warranty shall cover defects in the installation workmanship for full warranty period. Workmanship includes, but not limited to, seam installation (glued and sewn), inlay installation, proper installation of infill materials, and securing of turf system to nailer board.
 - b. The Turf Manufacturer shall verify that Supervisory Personnel have inspected the installation and that the work conforms to the manufacturer’s requirements.
 - 4. Warranty Replacement:
 - a. The warranty shall specifically exclude acts of vandalism and acts of God beyond the control of the Owner or the Manufacturer.
 - b. All items covered by the Warranty are to be replaced or repaired with new materials, including installation at the sole expense of the warranting manufacturer for the life of the warranty period. Replacement or repair of affected areas shall include all necessary materials, labor, and transportation costs to complete repairs.
 - c. Must have a provision to either make a cash refund or repair/replace such portions of the installed materials that are no longer serviceable to maintain a playable surface.
- C. Warranty and Maintenance Obligations:
 - 1. The Turf Manufacturer/Supplier shall be required to inspect all areas of concern and make necessary corrections under the warranty during each visit, including, but not limited to the following requirements:
 - a. Attachment of turf system to Nailer Board / Concrete Curb complies with original installation.
 - b. Inlays, Numbers, Logos and Seam Conditions.
 - c. Fiber Conditions.
 - d. Fiber Height.
 - e. Infill Condition.
 - f. Infill Height / Compaction.
 - 2. Turf Manufacturer identify specific or average areas not meeting requirements of the warranty and bring to the Owner’s attention. Determine with Owner additional infill material that may be required to maintain G-max and HIC levels.
 - 3. Test results, inspection reports, field repairs, and field concerns shall be submitted to Owner and the Landscape Architect in a Field Inspection Report and Testing Results for review.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All components and their installation method shall be designed and manufactured for use on outdoor athletic fields. The finished surface shall resist abrasion and cutting from normal use.
- B. The materials and turf system should be able to withstand full climatic exposure and shall be resistant to insects, rot, fungus, mildew, ultraviolet light degradation, heat degradation, and shall be non-allergenic and non-toxic.
- C. The turf system shall consist of an artificial grass-like surface pile, which shall be tufted into a primary backing and coated with a secondary backing to lock in the tufted fibers. The turf system shall be constructed to maximize dimensional stability and to resist damage and normal wear and tear from its designated uses.
- D. The entire turf system shall have the basic characteristics of flow-through drainage, allowing free movement of surface runoff through the turf system where such water may flow to the sub-base and field drainage system. The Turf System shall remain free-draining at all times before, during, and after the infill materials are installed.
- E. Turf fibers shall be a proven athletic caliber yarn designed specifically for outdoor use and shall resemble natural grass appearance, texture and color. Streaks, discoloration, or different dye lots shall not be accepted and may be grounds for product rejection. The turf fiber shall provide good traction in all types of weather with the use of conventional sneakers type shoes, composition mold sole athletic shoes, baseball spikes, and screw-on football cleats.
- F. In addition to the tufted lines, inlaid lines and logos, the pile surface shall be suitable for both temporary and permanent line markings using paint specifically developed for this use and as recommended by the turf manufacturer.
- G. The Turf Fabric surface shall be constructed and installed in minimum roll widths of 15 feet with no longitudinal or transverse seams, except for inlaid lines with finished roll assembly.
- H. All adhesives used in bonding the inlaid markings to the adjacent carpet shall be resistant to moisture, bacteria and fungus attacks, and resistant to ultraviolet radiation. Adhesives used shall be as recommended by the Turf Manufacturer.

2.2 PRODUCTS

A. Synthetic Turf Products:

1. The synthetic turf material and resilient infill shall be in accordance with the following:

Physical Properties	Minimum Specification Requirements
Pile Height	2.0"
Fiber Composition	Polyethylene, Parallel-Slit and Monofilament Blend
Pile Ribbon Weight	44 oz./sy
Primary Backing Weight	8 oz./sy
Secondary Backing Weight	24 oz./sy
Total Product Weight	76 oz./sy
Denier - Parallel Slit	10,000
Denier - Monofilament	11,000
Fiber Thickness - Parallel Slit	>100 microns
Fiber Thickness - Monofilament	>230 microns
Primary Backing Material	Polypropylene
Secondary Backing Material	Polyurethane
Turf Bind	> 8 lbs w/o infill
Approved Yarn Suppliers	Tencate XP Blade Plus Polytex (Duramax Minimum) *Proprietary fiber may only be used if it has been pre-approved by Architect within 6 months' time from date of Project Bid
Grab Tear Strength - Width	300 lbs/force
Grab Tear Strength - Length	180 lbs/force
Stitch Gauge	< 1/2"

****Note:** Exceptions to Specifications shall be outlined within Proposal.

2. **ALTERNATE BID:**
Blended parallel slit, monofilament polyethylene turf carpet with thatch layer. The synthetic turf material and resilient infill shall be in accordance with the following:

Physical Properties	Minimum Specification Requirements
Pile Height	2.0"
Fiber Composition	Polyethylene, Parallel-Slit and Monofilament Blend
Pile Ribbon Weight	52 oz./sy
Primary Backing Weight	8 oz./sy
Secondary Backing Weight	26 oz./sy
Total Product Weight	86 oz./sy
Denier - Parallel Slit	10,000
Denier - Monofilament	11,000
Denier - Thatch	5,000
Fiber Thickness - Parallel Slit	>100 microns
Fiber Thickness - Monofilament	>230 microns
Primary Backing Material	Polypropylene
Secondary Backing Material	Polyurethane
Turf Bind	> 8 lbs w/o infill
Approved Yarn Suppliers	Tencate XP Blade Plus Polytex (Duramax Minimum) *Proprietary fiber may only be used if it has been pre-approved by Architect within 6 months' time from date of Project Bid
Grab Tear Strength - Width	300 lbs/force
Grab Tear Strength - Length	180 lbs/force
Stitch Gauge	< 1/2"

****Note:** Exceptions to Specifications shall be outlined within Proposal.

- B. Carpet Backing:
- The primary backing shall consist of a one part, three component polyester/polypropylene backing and treated with UV inhibitors.
 - The secondary backing shall consist of an application of porous polyurethane, heat activated to permanently lock fibers in place. Products using latex based secondary backings will not be acceptable.
 - Perforations:
 - Synthetic turf surfacing shall be perforated to provide vertical drainage or the secondary backing can be applied to the tufted fiber rows. Complete synthetic grass system shall drain in excess of 10" per hour.
 - Perforations shall be uniformly spaced at 4 inches, in both directions.
 - Perforations shall be tested by passing a 3/8" drill bit through the holes with no more than 7 lbs. pressure.
- C. Turf Panels, Markings and Logos.
- The carpet shall be delivered in 15-foot wide rolls with the four 4 inch white, 5-yard lines tufted into the ends of each roll.

2. The rolls shall be of sufficient length to go from sideline to sideline. The perimeter white line shall be tufted into the individual sideline rolls. Head seams between the sidelines of the football field will not be acceptable.
3. All field lining, marking, field boundary system with the team area limits, logos, etc. shall be the same material (yarn, infill, and backing) as the playing field system.
4. Lines, logos, and graphics to be installed per the design documents and approved shop drawings are to be tufted in the factory to the maximum extent practical. Those not tufted in the factory shall be inlaid in the field.
5. Logos and inlays shall be true and shall not vary more than 1/2" from specified width and location.
6. The primary fiber color of the band field shall be Field Green
7. The primary fiber color of the stadium and auxiliary playing fields shall be Low Contrast alternating panels of alternating panels of Field Green and Field/Lime Green (50/50 A/B by row)
8. Primary Field Markings and Lines:
 - a. Football: 4" White.
 - b. Soccer: 4" Yellow.
 - c. Men's Lacrosse: 4" Gray.
 - d. Women's Lacrosse: 4" Black.
 - e. Baseball and Softball: 4" Tick marks for plates and bases.

D. Infill Materials:

1. Infill Materials shall be uniformly filled to a depth which leaves no more than 1/2" of exposed pile after settlement.
 - a. Infill materials shall be new material and consist of a homogeneous non-compacting mixture of uniformly sized ambient and/or cryogenic SBR crumb rubber and silica sand.
 - b. For installations over aggregate stone base (no shock pad), the crumb rubber content shall be approximately 60-70% by weight and the sand content shall be 30-40% by weight. Manufacturer shall provide proposed infill ratios based on pre-installation testing.
 - c. For installations over shock pad, the crumb rubber content shall be approximately 30-40% by weight and the sand content shall be 60-70% by weight. Manufacturer shall provide proposed infill ratios based on pre-installation testing.
2. Crumb Rubber:
 - a. The CRI used in artificial turf fields shall be derived from used whole vulcanized automobile, SUV, and truck tires (DOT tires for over the road). Buffing's, bladders and tubes shall not be used as feedstock for CRI. No factory tires rejects are allowed.
 - b. The Crumb Rubber shall have a specific gravity range from 1.1 minimum to 1.2 maximum as determined by ASTM D 297.
 - c. Shall be free of all metal and produced with 100% recycled automobile or truck tires. The material shall have a size not to exceed 10 mesh nor smaller than 20 mesh.
 - d. The fine particles shall not exceed 10% and shall have no visible evidence of steel particles present in the final synthetic turf surfacing.
 - e. Crumb rubber shall be UV stable and resistant to heat degradation.
 - f. Rubber Mesh

*Mesh (ASTM E-11)	
8	
12	1.3%
16	58.8%
20	38.2%
30	1.0%
40	0.0%
50	0.0%
PAN	Not-to-exceed 0.004%

3. Silica Sand:
 - a. Round, uniformly-sized pure silica sand.
 - b. Sized between US Sieve 20 to 40.
- E. Maintenance Equipment: Turf Contractor/Manufacturer shall provide the following equipment as part of the Base Bid.
 1. Greens Groomer - Model # 920SDE as manufactured by GreensGroomer World Wide, Inc.
 2. Sweeper unit shall be:
 - a. "Litter Kat w/magnet" by GreensGroomer World Wide, Inc, Indianapolis, IN.
 - b. "Crewzer Junior" by Pioneer Athletics (800) 877-1500.
 3. Groomer/Sweeper combined unit shall be:
 - a. "Turfcare TCA1400 with magnet" by SMG, Germany.
 4. Maintenance equipment proprietary to Turf Manufacturer may be submitted as a Voluntary Alternate to the project.

PART 3 EXECUTION

3.1 GENERAL

- A. The Contractor shall perform all work in strict accordance to the Contract Drawings, Approved Shop Drawings and manufacturer's written specifications and instructions.
- B. The Contractor shall be responsible for the inspecting, verifying, and completing all installed work of this section.
- C. Environmental Conditions: The Contractor shall not perform any work if the conditions for working are:
 1. Ambient air temperatures are below 45 degrees F.
 2. Material temperatures are below 45 degrees F.
 3. Surfaces are wet or damp.
 4. Rain is imminent or falling.
 5. Conditions exist or are imminent, which will be unsuitable to installation requirements of the systems specified herein. Humidity levels will be inside the limits recommended by the adhesive manufacturer to obtain optimum bonding characteristics of the surfaces.

3.2 EXAMINATION

- A. Acceptance of Base Construction: Upon completion of the base and drainage work, a written "Certification of Acceptance of the Base Construction" is required from the synthetic turf manufacturer and/or installation contractor (referred to herein as "Surfacing Contractor") prior to proceeding with any installation work under this section of the specifications.
- B. The Certification shall include but not be limited to the acceptance of the following:
 1. Surfacing Contractor has reviewed the base construction finish surface and is accepting the construction is acceptable for application of work under this Section.
 2. Surfacing Contractor has been provided testing results of water permeability and accepts the results to place the synthetic turf material.
 3. The materials and method of installation for the aggregate stone base construction is in conformance with the manufacturer's current recommendations for the application of the turf to be installed under this section.
 4. Surfacing Contractor has reviewed the base construction with representatives of the Site Contractor and Landscape Architect and all parties are satisfied with the compaction and planarity of the surface.

5. The base construction finish surface is clean and free of contaminants.
 6. Continuing with the installation of the synthetic turf materials and performance shock pad without issuance of a Certification of Acceptance Letter shall be considered as an approval of the base by the Turf Contractor.
- C. All discrepancies between the required materials, application and tolerance requirements noted by the installer shall be brought immediately to the attention of the Contractor and Landscape Architect. Failure to immediately inform the Site Contractor and Landscape Architect of any prior work which does not meet the required specifications for installation of the artificial turf surfacing system shall be considered an acceptance by the installer of the non-conforming work.

3.3 INSTALLATION OF TURF AND COMPONENTS

A. GENERAL:

1. All installation shall be done in strict accordance with the manufacturer's current written installation instructions approved by the Landscape Architect.
2. The synthetic turf shall be staged and unrolled as necessary for a daily installation. No material shall be allowed to remain unrolled for a period of 24 hours prior to installation.
3. In the event of damage during delivery, staging, or installation, immediately make all repairs and replacements necessary to the approval of the Landscape Architect and at no additional cost to the Owner.
4. The pile lay of the turf shall be installed facing the home bleacher side of the field, unless noted otherwise. During the turf panel installation process, the Contractor shall continuously check the field layout dimensions in all directions.

B. SEAMS.

1. All panel seam spacing shall be held to a minimum of 15 feet in width unless prior approval of seaming diagram indicates a lesser panel width.
 - a. For fields with football yardlines, all seams shall be adjacent to 4" white yardline. Yardlines placed in the middle of the carpet roll will not be permitted. See Section 2.2, C. #1, this Specification.
2. The mechanical or adhesive bonding of all system material components shall provide a permanent, tight, secure and hazard free athletic playing surface.
3. All panel seams are to be held to the absolute minimum and as approved by Landscape Architect. Ridges or tenting of seams is not acceptable. Gaps greater than 1/8" are not acceptable.
4. Seams within the body of the field shall be sewn with a high strength polyester fiber cord.
 - a. Sewn seams shall be butt-sewn with a double loop lock stitch.
 - b. Hand-bagger type seam stitching is not permitted.
 - c. Seams shall lay flat after infill installation.
5. Traverse panel seams shall be securely sewn or glued and lay flat. A minimum of 5" of seaming tape and glue shall extend on either side of the seam.

C. LINES, MARKINGS, AND INLAYS.

1. Lines and markings shall be tufted in the factory to the greatest extent possible during manufacturing.
2. Lines and markings not tufted in the factory are to be field cut, inlaid and glued with manufacturer approved adhesive or hot-melt. Shaving and gluing of inlays is not a permitted method of installation.
3. All lines and markings shall be installed and verified prior to installation of infill material.
4. All inlays shall have a 12" wide manufacturer approved seaming tape, which is fully coated with adhesive.
 - a. Bonding surfaces shall be clean, dry and free from grease, oil, wax, or other contaminants.
5. All seams and inlays shall be thoroughly brushed or picked before infill materials are installed.
6. All seams and inlays shall be fully fastened with no loose areas. At no time should pulling of section allow for separation of the turf from the seaming tape. Gaps greater than 1/8" are not acceptable.

7. Install turf as required to boxes/lids as shown on plans.

D. TURF EDGES AND TERMINATION.

1. The perimeter of the field shall be firmly secured to the wood nailer edge, for the life of the warranty and as detailed, using stainless steel or hot dipped galvanized fasteners, minimum 1" in length. Fastener spacing shall not exceed 12 inches on-center.
2. Final infill level shall be flush with adjacent anchor curb or track surfacing.

E. INFILL INSTALLTION.

1. No infill materials shall be installed until the synthetic turf system is fully installed with all lines, markings, and logos. Infill level on box covers/lids shall be flush with adjacent turf infill.
2. The infilling operation shall only take place with dry material, dry field conditions, and no forecasted threat of rain or snow.
3. Open utility grates and drains shall be covered by turf installer prior to placing infill.
4. The synthetic turf surface shall be thoroughly brushed prior to installation of infill materials to remove any wrinkles.
5. The infill shall be installed at a rate determined by the manufacturer. Infill material shall be thoroughly raked and brushed into the turf fibers during each pass of the broadcasting unit.
6. The infill shall not leave more than 1/2" exposed fiber after settlement.

3.4 CLEANING

- A. Contractor shall be responsible for clean up of all materials utilized on a daily basis. Upon completion of installation, all surrounding areas, including turf area, shall be clean and in "game" condition.
- B. Contractor shall utilize magnetic bar to remove any metal objects within the field prior to infill and after infill, before final acceptance.
- C. Final grooming of the field should include application of an antistatic agent.
- D. Contractor shall be responsible to neatly place attic stock on pallets and deliver to a suitable location as directed by Owner.
- E. All excess infill outside of the playing surface shall be properly removed and disposed of and deemed acceptable to Owner and Landscape Architect.

3.5 ACCEPTANCE, MAINTENANCE, AND PROJECT CLOSE-OUT

A. ACCEPTANCE.

1. Should any imperfections develop in the surface areas prior to the final acceptance of the work and deemed to not have been vandalism or an Act of God, they shall be removed and replaced with new materials. All such repair work shall be done at no additional cost to the Owner.
2. Final acceptance will be issued to the Contractor as described and issued with a formal "Certificate of Substantial Completion". The Owner or Landscape Architect will not be responsible for any additional acceptance requirements by the Contractor or their subcontractors.

B. MAINTENANCE.

1. Following turf system installation, the Turf Contractor shall be responsible for training the Owner's personnel in necessary maintenance of the turf system. Prior to conducting training, Contractor shall assemble and test all maintenance equipment. Equipment should be fully functional and ready to use at the time of training.
2. Owner Training shall include review and demonstration of the following items:
 - a. Daily / Weekly fiber, infill and seam inspections.

- b. Hand grooming low infill and techniques for placing infill.
 - c. Emergency seam repair.
 - d. Proper methods for field sweeping and grooming: including demonstration of hook-up, detachment, transporting, and use of all equipment.
 - e. Field Snow Plowing (as applicable).
 - f. Protection of surface for events.
 - g. Procedure for Warranty Claims.
3. Maintenance training shall take place no later than fourteen (14) days after "Quality Control/Post-Installation Testing" is completed.

C. PROJECT CLOSE-OUT.

1. Contractor shall furnish three (3) copies of Maintenance Manuals, which shall include all necessary instructions for the proper care and preventative maintenance of the turf system, including painting, markings, small repair procedures, and cleaning.
2. Maintenance Manual shall include list of procedures required to maintain surface condition and activities to be avoided, including static and dynamic load limits, snow clearing, etc.
3. Provide Project Record Documents: Record actual locations of seams, utility boxes, or other pertinent information.
4. Provide sample Maintenance Log Book and proposed Testing Schedule for all required testing during Warranty Period.
5. Attic Stock Materials:
 - a. The Contractor shall supply and deliver (1) bag (+/- 2,000lbs) of additional rubber infill and +/- 500 pounds of silica sand, in original packaging.
 - b. Green Turf Fabric: provide minimum 500sf for each green color used, which shall include two (2) pieces that are 15' x 10'.
 - c. Colored Turf Fabric: provide minimum 150sf for each non-green color used.
 - d. Line Striping: provide 100lf of 4" White line striping.

END OF SECTION 32 1818

SECTION 32 3130 - CHAINLINK FENCE - VINYL

PART 1 GENERAL

1.1 SUMMARY

- A. This Section is a part of the entire set of Contract Documents and shall be coordinated with the applicable provisions of the other parts.
- B. Related Sections:
 - 1. Section 03 3010 Cast In Place Concrete.

1.2 SCOPE

- A. The work under this section of the specifications shall consist of furnishing all labor, materials and equipment necessary for a new black vinyl chainlink fence system as indicated herein and on the Contract Documents. Work shall include but not limited to footings, posts, fabric, rails, gates and all related hardware.

1.3 QUALITY ASSURANCE AND WARRANTY GUARANTEE

- A. American Society for Testing and Materials (ASTM) latest version:
 - 1. ASTM A53 - Standard Specification for Pip, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A90 - Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - 3. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
 - 4. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. ASTM F626 - Standard Specification for Fence Fittings.
 - 6. ASTM F668 - Standard Specification for Polymer Coated Chainlink Fence Fabric.
 - 7. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
 - 8. ASTM F934 - Standard Practice for Standard Colors for Polymer Coated Chainlink.
 - 9. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Chainlink Fence Framework.
 - 10. ASTM F1083 - Standard Specification for Pipe, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- B. Weights and tolerances to conform to Federal Specification RR-F-191G dated January 25, 1974.
- C. The Contractor and any Sub-Contractor hereunder guarantee their respective work against defective materials or workmanship for a period of one (1) year from the date of filing Certificate of Substantial Completion and as accepted by the Owner.
- D. All material installed under this specification shall be subject to testing by the Owner. Any material so inspected and found to be not in strict conformance with this specification shall be promptly removed and replaced by the Contractor at his expense.

1.4 SUBMITTALS

- A. Shop drawings showing plan layout, spacing of components, post foundation dimensions, hardware, gates and schedule of components.
- B. Product Data: Submit product data on fabric pattern, posts, accessories, fittings and hardware.
- C. Samples: Color selection for vinyl finishes. If requested, samples of materials (e.g., fabric, wires, and accessories).
- D. Mill Certificates conforming to ASTM F1043 for Coating Requirements and Adhesion Testing.
 - 1. Test Results shall be provided before material is shipped to site.
 - 2. Minimum (3) random tests for each post size specified.
- E. At the request of the Architect, provide Material Certificates confirming product provided is Domestic pipe.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in the manufacturing of products specified in this section with a minimum of ten (10) years' experience.
- B. Installer: Company specializing in performing work of this section with a minimum of five (5) years experience. Must have a minimum of two in-house fence installation crews.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chainlink fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.
- B. Identify each package with manufacturer's name.
- C. Store fence fabric and accessories in a secure and dry place.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which Installer agrees to repair or replace components of chainlink fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Framework, posts, rails, fabric and fittings for chainlink fence system shall be domestic pipe manufactured and supplied by the following:
1. Merchants Metals - Color Bond Product:
 - a. Phone: (888) 260-1600.
 2. Master Halco - Permafused Product.
 - a. Phone: (888) 643-3623.

2.2 VINYL CLAD CHAINLINK FENCE

- A. This specification covers chain link fabric made from galvanized steel wire which has been coated with polyvinyl chloride compound hereinafter designated as "vinyl." The base metal shall be steel of such quality and purity that, when drawn to the size of wire specified and coated with vinyl, the finished fencing shall be of uniform quality and have the properties and characteristics as prescribed in the specification. Wire used for the manufacture of this fabric shall be capable of being woven into fabric without the vinyl coating voiding, cracking or peeling. Vinyl shall be plasticized and thoroughly compounded.
- B. Thermal Fused Vinyl: The thermally fused vinyl coated wire shall consist of vinyl thermally fused to primed zinc coated wire. The zinc coating shall be in accordance with ASTM A641, .30 oz. per square foot. The vinyl adhesion shall be greater than the cohesive strength of the vinyl material itself.
- C. Physical Properties of Coating.
1. Accelerated Aging: PVC coated wire from which the fabric is woven shall withstand exposure for 1000 hours without failure at a black panel temperature of 145(F, Type BH apparatus described in ASTM G155 shall be used for the test. The product shall be construed to have failed the test if:
 - a. The wire fails to withstand the Mandrel Bend Test described below.
 - b. Shrinkage of the PVC coating is greater than 1/16" per foot of wire.
 - c. There is a significant change in color or gloss of the PVC surface as determined by visual inspection.
 2. Mandrel Bend Test: PVC coated wire when subjected to a single bend at -20(F around a mandrel no larger than ten times the diameter of the wire shall not exhibit breaks or cracks in the PVC coating. The Mandrel Bend Test shall be performed on an individual piece of wire removed from the fabric. This specimen may be any length of wire over 12" and shall include both bends and straight sections, but shall not include either twists or knuckles.
 3. Color of Coatings:

Hue	Black
Tolerance	2.0 G
Value	3.02
Chroma	2.35

- D. Workmanship: Vinyl coated chain link fabric shall be produced by methods recognized as good commercial practices. Careful inspection shall be made to determine the quality of vinyl coating. Coatings not free from pinholes, bubbles or voids, rough or blistered surfaces shall provide a basis for rejection. An apparent mismatch of color readily discernible by visual inspection shall be cause for rejection.

- E. Weight of Zinc Coating: The weight of coating shall be determined on individual pieces of wire removed from the fabric. The specimens may be of any continuous length of 12 inches, but preferably about 24 inches long. The weight of coating shall be determined in accordance with tests for weight of coating described in ASTM A90. The weight of zinc coating shall be determined after removing the vinyl coating from the fabric.

2.3 VINYL CLAD FRAMEWORK

- A. General: The framework consists of all line, corner, terminal posts, horizontal rails and gate frame materials which shall be coated with a polyvinyl chloride coating 10 to 12 mils in thickness over galvanized steel or aluminum. These surfaces shall be thermally fused to the metal surface with an appropriate sured primer. The PVC shall be plasticized and thoroughly compounded so that all pigments, stabilizers and other ingredients are fully dispersed.
- B. Color of Framework: The color of framework shall match the fabric.
- C. Fabric: The wire used in the vinyl coated fences shall possess a minimum breakload of 850 pounds. The coated size of the thermally fused vinyl fence wire shall be 9 gauge core, 8 gauge finish (Class 2B). Vinyl coated fabric shall be woven to form a 2" mesh (1 ¾" mesh for tennis court fence). The size of mesh shall be determined by measuring the minimum clear distance between the wires forming the parallel sides of the mesh, measured in either direction. The tolerance in the size of mesh shall be +/- 1/8" inch. The thickness of the vinyl coating shall be 0.007".
- D. Framework Materials: Framework materials shall be, before coating with PVC, either Type I Schedule 40 pipe with 1.8 ounce per square foot zinc coating before resin coating, or Type II pipe manufactured from steel conforming to the Standard Specification for Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses, ASTM A53; or TYPE II pipe manufactured from steel conforming to ASTM A1011, Cold-Rolled, Electric welded and Triple Coated with 1.0 ounce, +/- 0.1 ounce zinc per square foot. The internal surface shall have corrosion protection by a zinc-rich based organic coating with 87% minimum zinc powder loading, with the capability of withstanding 350 hours when subjected to Salt Spray Test ASTM B117, with a 5% minimum Red Rust.
- E. Line Posts: Shall be one of the following vinyl coated materials: Type I, 2.375" O.D. round steel posts weighing 3.65 lbs. per lineal foot; or, alternately, Type II 2.375" O.D. round steel pipe weighing 2.78 lbs. per foot or roll-formed "c" section posts measuring 2.25 inches by 1.70" weighing 2.73 lb. per lineal foot. Posts shall not be splice welded in such a manner that the weld appears above the grade line. The chain link fabric shall be tied to the line posts with vinyl coated clips or tie wires with a minimum steel diameter of 0.132" and spaced on 15" maximum centers.
- F. Terminal and Gate Posts: Terminal and gate posts shall be one of the following vinyl coated materials: two and one-half inch (2 1/2") square tubing weighing 5.10 lbs per lineal foot, or alternately, Type I, 2.875" OD steel round posts weighing 3.66 lbs. per lineal foot, or Type II 2.875" OD steel round posts weighing 4.64 lbs per lineal foot. Posts shall not be splice welded in such a manner that the weld appears above the grade line.
- G. Terminal and Gate Post Fittings: Terminal and gate post fittings, including tension bands, brace connections and top rail connections, shall be 14 gauge, hot-dipped galvanized, cold-rolled, carbon steel. Top rail, brace and truss bands shall not be less than ¾" wide, secured by 5/16" diameter carriage bolts. Tension bars shall not be less than 2" shorter than the nominal height of the fabric with which they are to be used. One tension bar shall be provided for each end and gate post, and two for each corner and pull post.
- H. All fixed component parts such as post tops, bands, connectors, and rail ends shall be vinyl coated on visible surfaces of a color to match the fabric and framework. Non-visible portions of parts may be

uncoated in the case of aluminum components. Non-visible portions of steel or iron components not vinyl coated must be coated with zinc as per ASTM A153.

- I. All hardware and caps shall be made in the USA.
- J. Top, Intermediate and Bottom Rail: Top, intermediate and bottom rails (where applicable) shall be vinyl coated Type I, 1.660" O.D. round steel pipe weighing 2.27 lbs. per lineal foot, or Type II, 1.660" O.D. round steel pipe weighing 1.59 lbs. per lineal foot. An outside sleeve type coupling measuring not less than 6" in length shall be provided at each interval of twenty-one feet. The chain link fabric shall be tied to the rails at intervals of 24" with vinyl clad tie wires, 13 gauge for double wrap ties or 9 gauge for single wrap ties. Wrap ties shall have a minimum of two (2) loops at each end. Intermediate rails shall be fastened between posts with vinyl clad boulevard type connectors or bands and rail end caps. The terminal ends of all top, bottom, mid and bracing rails shall utilize rail end cups and boulevard hardware that prevents insects from gaining access into top rails.
- K. Bottom Tension Wire: Bottom tension wire shall be No. 6 gauge galvanized steel coil, vinyl coated tension wire, high carbon or hard drawn, Class II, Aluminum Coated, fastened to the chain link fabric at intervals of twenty-four inches (24") with No. 11 gauge galvanized steel hog rings. Hog rings shall be closed 100%.
- L. Brace Rail for Terminal and Gate Posts: Vinyl coated terminal and gate posts shall be strengthened and reinforced by vinyl coated braces meeting the same specifications as above. Braces shall be installed midway between top rail and court surface and extend from each terminal post to the first adjacent line post. Braces shall be securely fastened to posts by vinyl coated heavy pressed steel connections and also be trussed from line post back to terminal post with a 5/16" vinyl coated round truss rod complete with tightening turnbuckle.
- M. Posts Spacing and Settings: Line and terminal posts shall be set in concrete foundations not less than 12" in diameter and not less than 42" in depth. The concrete shall have a design mix of 3500 PSI. Spacing of posts in the line of fence shall be uniform and no more than eight-feet (8') apart. The smaller side of a "C" post shall be touching the chain link fabric and all open slots shall be facing in the same direction.
- N. Post Tops: Tops of line posts shall be of a vinyl coated steel or aluminum casting capable of providing a through passage for top rail. Terminal post tops shall be of a vinyl coated steel or aluminum casting and be designed so as to exclude all moisture from the terminal post. Post caps shall be domed in shape. Post caps at terminal posts shall be securely fastened to prevent removal.
- O. Gates: Gate openings shall not be less than 4 feet wide and constructed and hung as detailed on drawings. Frame shall be assembled from vinyl coated 2" square aluminum, alloy 6063-T6 or 6061-T6, weighing 0.940 lbs. per foot, Type I pipe weighing 2.72 lbs. per foot, or Type II, 1.90" O.D. round steel pipe weighing 2.28 lbs. per foot. Gate frames shall be welded or alternately shall utilize corner fittings of compressed or riveted type. A diagonal truss rod not less than 5/16" diameter shall be used on frames utilizing corner fittings. Color of the gate frame materials shall match the fence framework and component parts.
 - 1. Fabric matching the fence fabric shall be installed in the frame by means of tension bars and hook bolts or bands. Galvanized gate frame and gate post hinges shall be furnished of adequate strength for the gate size specified and to allow for a 180° swing. Gates shall be equipped with a positive strong arm latching device that will accommodate padlocking. A plunger rod, catch and semi-automatic outer catch shall be installed on drive gates so as to secure gates in an open position. Hinges, latches and catches shall be approved by the Landscape Architect.
- P. Hardware.
 - 1. All hardware requiring nuts and bolts should have no more than 1/2" of the threaded bolt extending beyond the nut.

2. All hardware shall come vinyl coated or shall be coated in the field with a vinyl base compound after installation. Aerosol spray paint to match the color of the vinyl fencing is only permitted for minor touch-ups.
3. Gate hinges shall be Bulldog Hinges.
4. Gate latches shall be commercial grade Strong Arm gate latches.
 - a. Fork & collar not approved.

Q. Driven Post Caulk.

1. Contractor is responsible to caulk around all driven fence posts.
2. Caulk shall be supplied from the following manufacturer:
 - a. Sportmaster "Courtflex Crack Sealant".
 - b. Phone: 800-395-7325.
 - c. Color: Neutral.

2.4 PRIVACY SLATS

- A. PVT Privacy Slats: PVT tubular slats to be inserted in the new 2" chain link fence along the north property line. Slats should be made of high density virgin polyethylene, color pigments, and ultra violet inhibitor to retard sunlight. Slats shall have a "snap-in" locking effect at the bottom of the fence. Slats shall be resistant to heat at 270 degrees Fahrenheit, have a low temperature brittleness of -76 degrees Fahrenheit, should conform to a tensile strength of 3700 as per ASTM D638, and have a wind load factor of 75% when installed. Melt index should be 0.24, Density 0.951, and with a Flexural Modulus of 144 PSI per ASTM D747.

- B. Manufacturer: PrivacyLink®

P.O. Box 295 Hyde Park, UT 84318 Phone: (800) 574-1076 Fax: (435) 563-1062

- C. Color: Color shall be selected by Owner from Manufacturers standard colors. Contractor shall submit color chart for selection.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
1. Do not begin installation before final grading is completed unless permitted by Architect.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. 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.

3.2 INSTALLATION

- A. All posts shall be set plumb and in accordance with the following table (unless specified otherwise):
1. Corner/Terminal and Bracing Post - General Fence

Fabric Height	Post Depth	Diameter of Foundation	Foundation Depth	Maximum Spacing
0' - 6'-0"	36"	12" min	42"	8'-0"
6'-1" - 12'-0"	36"	12" min	42"	8'-0"

2. Line posts shall be pneumatically driven into the ground using the following chart*:

Fabric Height	Pipe Below Grade	Total Length of Post
4'	4'	8'
6'	5'	11'
8'	6'	14'
10'	7'	17'
12'	8'	20'

- 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 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.
- D. Fence posts shall be installed with maximum 6 inches clear opening from end posts to buildings, fences, property lines or other structures.
- E. Install gates level, plum and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Adjust hardware for smooth operation and lubricate where necessary.
- F. The fabric shall be installed on the court/playing side of posts. Bottom of fence fabric shall be 3/4" (+/- 1/4") above the finished court surface. Fabric shall be furnished with selva knuckled on both ends.
- G. Top of concrete footing shall be left down and topped with surrounding pavings as detailed. Cold patch is not acceptable.

3.3 CLEAN UP AND DISPOSAL

- A. Remove dirt, concrete and tags from all posts and rails.
- B. Remove from the site all equipment, materials, and debris resulting from construction work including this section. Leave work area neat and clean and in a condition acceptable by the Landscape Architect, Owner. All work shall be complete, ready for use, at the time of final acceptance.

END OF SECTION 32 3130

SECTION 32 3223 - CONCRETE SEGMENTAL RETAINING WALL

PART 1 GENERAL

1.1 SUMMARY

- A. The work covered by this section includes the furnishing of all labor, materials, equipment and incidentals for the design, inspection and construction of a modular concrete retaining wall including drainage system and reinforcement as shown on the Construction Drawings and as described by the Contract Specifications. The work included in this section consists of, but is not limited, to the following:
 - 1. Design, inspection and certification by a registered professional engineer.
 - 2. Excavation and foundation soil preparation.
 - 3. Furnishing and placement of the levelling base.
 - 4. Furnishing and placement of the drainage system.
 - 5. Furnishing and placement of geotextiles.
 - 6. Furnishing and placement of segmental retaining wall facing units.
 - 7. Furnishing and placement of geosynthetic reinforcement.
 - 8. Furnishing and compaction of infill, drainage and retained soils.
- B. Related Sections.
 - 1. Section 02 1000 Site Preparation.
 - 2. Section 31 2000 Earthwork.

1.2 REFERENCE STANDARDS

- A. Engineering Design.
 - 1. NCMA Design Manual for Segmental Retaining Walls, Second Edition.
 - 2. NCMA TEK 2-4 - Specifications for Segmental Retaining Wall Units.
 - 3. NCMA SRWU-1 - Determination of Connection Strength between Geosynthetics and Segmental Concrete Units.
 - 4. NCMA SRWU-2 - Determination of Shear Strength between Segmental Concrete Units.
- B. Segmental Retaining Wall Units.
 - 1. ASTM C 140 - Sampling and Testing Concrete Masonry Units.
 - 2. ASTM C 1262 - Evaluating the Freeze - Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units.
 - 3. ASTM C 33 - Specification for Concrete Aggregates.
 - 4. ASTM C 90 - Standard Specification for Load-Bearing Concrete Masonry Units.
 - 5. ASTM C 150- Specification for Portland Cement.
 - 6. ASTM C 595 - Specification for Blended Hydraulic Cements.
- C. Geotextile Filter.
 - 1. ASTM D 4751 - Standard Test Method for Apparent Opening Size.
- D. Geosynthetic Reinforcement.
 - 1. ASTM D 4595 - Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - 2. ASTM D 5262 - Test Method for Evaluating the Unconfined Creep Behaviour of Geosynthetics.
 - 3. GRI GG-1: Single Rib Geogrid Tensile Strength.
 - 4. GRI GG-5: Geogrid Pullout.
 - 5. GRI GT-6: Geotextile Pullout.

- E. Soils.
 - 1. ASTM D 698 - Moisture Density Relationship for Soils, Standard Method.
 - 2. ASTM D 422 - Gradation of Soils.
 - 3. ASTM D 424 - Atterberg Limits of Soils.
 - 4. ASTM D G51 - Soil Ph.
- F. Drainage Pipe.
 - 1. ASTM D 3034 - Specification for Polyvinyl Chloride (PVC) Plastic Pipe.
 - 2. ASTM D 1248 - Specification for Corrugated Plastic Pipe.
- G. Where specifications and reference documents conflict, the Owner or Owner's Representative shall make the final determination of applicable document.

1.3 APPROVED PRODUCTS

- A. Pisa II Stone Segmental Retaining Wall System as supplied by UNILOCK Ltd.,
 - 1. Telephone: (248)-437-7037.
- B. Color to be selected by Owner from manufacturer's standard colors.

1.4 THE CONTRACTOR

- A. The term Contractor shall refer to the individual or firm who will be installing the retaining wall.
- B. The Contractor must have the necessary experience for the project and have successfully completed projects of similar scope and size.

1.5 DELIVERY, MATERIAL HANDLING AND STORAGE

- A. The installing contractor shall check all materials delivered to the site to ensure that the correct materials have been received and are in good condition.
- B. The Contractor shall store and handle all materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, breaking, chipping or other causes.

1.6 ENGINEERING DESIGN AND CERTIFICATION

- A. The term Engineer shall refer to the individual or firm who has been retained by the Contractor to provide design and inspection services for the retaining wall. The Engineer must be qualified in the area of segmental retaining wall design and construction and must be licensed to practice engineering in the Province or State that the wall is to be constructed.
- B. The Engineer will perform the following tasks:
 - 1. Produce sealed construction drawings and detailed design calculations, completed in accordance with the design requirements outlined in Part 3 of these specifications.
 - 2. Review the site soil and geometric conditions to ensure the designed wall is compatible with the site prior to construction.
 - 3. Inspect the site conditions, materials incorporated into the retaining wall, and the construction practices used during the construction.

4. Provide the Contractor with a letter after completion, certifying the design meets the requirements of this specification, the design was compatible with the site and the wall was constructed according to design.

1.7 SUBMITTALS

- A. The Contractor shall submit the following information for approval thirty (30) days prior to the construction of the segmental retaining wall:
 1. Design Submittal - Provide three (3) sets of stamped construction drawings and detailed design calculations, completed and sealed by the Engineer in accordance with the design requirements outlined in Part 3 of this specification. A detailed explanation of the design properties for the geosynthetic reinforcements shall be submitted with the design.
 2. Materials Submittal - Manufacturer's certifications, stating that the SRW units, the geosynthetic reinforcement, and imported aggregates and soils meet the requirements of this specification and the Engineer's design.
 3. Installer Qualifications - The Contractor must be able to demonstrate that their field construction supervisor has the necessary experience for the project by providing documentation showing that they have successfully completed projects of similar scope and size.

1.8 MEASUREMENT FOR PAYMENT

- A. Payment for earthworks to prepare the site for the retaining wall construction will be included in the base bid. Additional earthwork as directed and approved in writing by the Owner, or Owner's representative, shall be paid for under a separate pay item.
- B. Payment for the retaining wall system will be included in the base bid. The vertical wall face area shall be measured from the top of the base or footing to the top of the coping course multiplied by the length of the wall. The contract unit price shall include the cost of all engineering, labor, materials, and equipment used to install the levelling base or spread footing, wall modules, drainage materials, infill soil, geosynthetic reinforcement, retained soil and site clean up. Additional vertical wall face area as directed and approved in writing by the Owner, or Owner's representative, shall be paid for under a separate pay item.

PART 2 PRODUCTS

2.1 DEFINITIONS

- A. Modular concrete retaining wall units are dry-cast solid concrete units that form the external fascia of a modular unit retaining wall system.
- B. Coping units are the last course of concrete units used to finish the top of the wall.
- C. Infill soil is specified material that is placed directly behind the drainage soil and within the reinforced zone, if applicable.
- D. Retained soil is an in-situ soil or a specified soil that is placed behind the wall infill soil.
- E. Foundation soil is the in-situ soil beneath the wall structure.
- F. Drainage aggregate is a free draining soil encapsulated in a suitable geotextile, and perforated pipe all wrapped in a geotextile, placed directly behind the modular concrete units.

- G. Drainage pipe is a perforated polyethylene pipe used to carry water, collected at the base of a soil retaining wall, to outlets in order to prevent pore water pressures from building up behind the wall facing modules.
- H. Non-woven geotextiles are permeable synthetic fabrics formed from a random arrangement of fibers in a planar structure. They allow the passage of water from one soil medium to another while preventing the migration of fine particles that might clog a drainage medium.
- I. Geogrid reinforcement is a polymer grid structure having tensile strength and durability properties that are suitable for soil reinforcement applications.
- J. All values stated in metric units shall be considered as accurate. Values in parenthesis stated in imperial units are the nominal equivalents.

2.2 PRODUCTS

- A. Concrete Segmental Retaining Wall Units.
 - 1. The concrete wall modules shall be 150 x 200 x 300 mm (6 x 8 x 12 inches) with a maximum tolerance of plus or minus 3 mm (1/8 in.) for each dimension. In some U.S. locations the concrete wall modules have the alternate dimensions of 185 x 991 x 500 mm (7.25 x 39 x 20 inches).
 - 2. The concrete wall modules shall have a integral shear key connection that shall be offset to permit a minimum wall batter of 1H : 8V.
 - 3. The concrete wall modules shall have a minimum 28-day compressive strength of 35 MPa (5000 psi) as tested in accordance with ASTM C 140. The concrete shall have a maximum moisture absorption rate of 5 percent to ensure adequate freeze-thaw protection.
- B. Infill Soil.
 - 1. The infill soil shall consist of free draining sands or gravels with less than 5% passing the #200 sieve size or as specified in the Construction Drawings.
 - 2. The Engineer shall review and determine the suitability of the wall infill soil at the time of construction.
- C. Retained Soil.
 - 1. The retained soil shall be on site soils unless specified otherwise in the Construction Specifications or as directed by the Owner or Owner's Representative. If imported fill is required, it shall be examined and approved by the Engineer.
- D. Foundation Soil.
 - 1. The foundation soil shall be the native undisturbed on site soils. The foundation soil shall be examined and approval by the Engineer prior to the placement of the base material.
- E. Levelling Base Material.
 - 1. The footing material shall be non-frost susceptible, well graded compacted crushed stone (GW- Unified Soil Classification System).
- F. Drainage Soil.
 - 1. The drainage soil shall be a free draining angular granular material of uniform particle size smaller than 25 mm (1 inch) separated from the infill soil or retained soil by a geotextile filter. The drainage soil shall be installed directly behind the SRW units if the infill soil is unable to provide adequate drainage capacity.
- G. Drainage Pipe.
 - 1. The drainage pipe shall be perforated corrugated HDPE or PVC pipe, with a minimum diameter of 150 mm (6 inches), protected by a geotextile filter to prevent the migration of soil particles into the pipe, or as specified on the construction drawings.

- H. Geotextile Filter.
1. The non-woven geotextile shall be installed as specified on the construction drawings. Although selection of the appropriate geotextile specifications is site soil specific, a commonly used geotextile for filtration will have an Apparent Opening Size ranging between 0.149 and 0.210 mm (U.S. Sieve Sizes 100 to 70) and a minimum unit weight of 170 grams per square meter (5.0 oz /square yard). The coefficient of permeability will typically range between 0.4 and 0.6 cm/second (0.16 to 0.24 in./second).
- I. Geogrid Reinforcement.
1. The Engineer shall determine the type, strength and placement location of the reinforcing geosynthetic. The design properties of the reinforcement shall be determined according to the procedures outlined in this specification. Detailed test data shall be submitted with the design calculations and shall include tensile strength (ASTM D 4595 or GGI GG-1), creep potential (ASTM D 5262), site damage and durability (GRI GG-4) and pullout resistance (GRI GG-5 or GRI-GT-6) and connection strength (NCMA SRWU-1).
- J. Concrete Adhesive.
1. The adhesive is used to permanently secure the coping stone to the top course of the wall. The adhesive must provide sufficient strength and remain flexible.

2.3 WALL DESIGN

- A. Design Standard.
1. The Engineer is responsible for providing a design that shall consider the external stability, internal stability, and local stability, including global stability, total and differential settlement, of the reinforced SRW / soil mass. The design life of the structure shall be 75 years unless otherwise specified in the construction drawings.
 2. The segmental retaining wall shall be designed in accordance with recommendations of the NCMA Design Manual for Segmental Retaining Walls, Second Edition. The following is a summary of the minimum factors of safety for the various modes of failure evaluated in the proposed design.

External Stability	
Base Sliding	1.5
Overturning	2.0
Bearing Capacity	2.0
Global Stability	1.3
Internal Stability	
Tensile Overstress	1.0
Pullout	1.5
Internal Sliding	1.5
Local Stability	
Facing Shear	1.5
Connection	1.5

B. Soil.

1. Design parameters: the Engineer shall specify the following soil parameters.

Infill Soil:	
Unit Weight	= [] kN/cu.m (lb/cu.ft)
Friction Angle	= [] deg
Cohesion	= 0 kPa (lb/sq.ft)
Retained Soil:	
Unit Weight	= [] kN/cu.m (lb/cu.ft)
Friction Angle	= [] deg
Cohesion	= 0 kPa (lb/sq.ft)
Foundation Soil:	
Unit Weight	= [] kN/cu.m (lb/cu.ft)
Friction Angle	= [] deg
Cohesion	= 0 kPa (lb/sq.ft)

C. Design Geometry.

- The length, height, and overall elevations of the retaining wall must comply with the requirements of the proposed elevation detail, station information and site grading plan.
- The structures' design height, H, shall be measured from the top of the levelling pad to the top of the wall where ground surface intercepts the wall facing.
- Slopes above and below all sections of the segmental retaining wall are detailed in the site grading plan.
- The minimum wall embedment shall be the greater of 1) the height of a SRW unit, 2) 150 mm (0.5 ft) or 3) the minimum embedment required because of the slope below the wall:

Slope Below Wall	Minimum embedment
Level	H/10
3 : 1 (18.4 deg)	H/10
2 : 1 (26.5 deg)	H/7

5. The following surcharges shall be applied to the top of each design cross section based on the following proposed uses above the wall.

Use Above Wall	Minimum Surcharge
No Traffic	0 kPa (0 lb/sq. ft)
Light Traffic	4.8 kPa (100 lb/sq. ft)

D. State of Stress.

- The lateral earth pressure to be resisted by the reinforcements at each reinforcement layer shall be calculated using the Coulomb coefficient of earth pressure, K_a , times the vertical stress at each reinforcement layer.
- The vertical soil stress at each reinforcement layer shall be taken equal to the unit weight of the soil times the depth to the reinforcement layer below the finished grade behind the facing units. A coefficient of active earth pressure, K_a , shall be used from the top to the bottom of the wall. The coefficient of active earth pressure, K_a , shall be assumed independent of all external loads except sloping fills. For sloping fills, the coefficient of active earth pressure, K_a , appropriate for the sloping condition, using Coulomb earth pressure shall be used in the analysis.

- E. Inclination of Failure Surface.
 - 1. A Coulomb failure surface passing through the base of the wall at the back of the reinforced zone up to the ground surface at or above the top of wall shall be assumed in design of walls.
- F. Geosynthetic Reinforcement.
 - 1. The allowable reinforcement tension, T_a , shall be determined in accordance with the method outlined in the NCMA Design Manual for Segmental Retaining Walls, Second Edition. This method calculates the Long Term Design Strength (LTDS) of the geosynthetic reinforcement by considering the time-temperature creep characteristics of the reinforcement, environmental degradation, construction-induced damage and an overall factor of safety.
- G. Geogrid Strength.
 - 1. The minimum soil reinforcement length shall be as required to achieve a minimum width of structure, B , measured from the front face of the wall to the end of the soil reinforcements. B must be greater than or equal to 60 percent of the total height, H . The length of the reinforcements at the top of the wall may be increased beyond the minimum length required to increase pullout resistance.
- H. Settlement Control.
 - 1. It is the responsibility of the Engineer to determine if the foundation soils will require special treatment to control total and differential settlement.
- I. Global Stability.
 - 1. It is the responsibility of the Engineer to determine if further design considerations must be implemented to ensure adequate global/overall slope stability.

PART 3 EXECUTION

3.1 INSPECTION

- A. The Engineer is responsible for verifying that the contractor meets all the requirements of the specification. This includes the use of approved materials and their proper installation.
- B. The Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work related to the retaining wall construction.

3.2 CONSTRUCTION TOLERANCES

- A. The following tolerances are the maximum allowable deviation from the planned construction:
 - 1. Vertical Control: ± 1.25 inches over a 10 ft distance, ± 3 inches total.
 - 2. Horizontal Control: ± 1.25 inches over a 10 ft distance, ± 3 inches total.
 - 3. Rotation: ± 2 degrees from planned wall batter.
 - 4. Bulging: 1.0 inch over a 10 ft distance.

3.3 SITE PREPARATION

- A. The foundation soil shall be excavated or filled as required to the grades and dimensions shown on the Construction Drawings or as directed by the Owner or Owner's Representative.
- B. The foundation soil shall be proof rolled and examined by the Engineer to ensure that it meets the minimum strength requirements according to the design assumptions. If unacceptable foundation soil is

encountered, the contractor shall excavate the affected areas and replace with suitable quality material under the direction of the Engineer.

- C. In cut situations, the native soil shall be excavated to the lines and grades shown on the Construction Drawings and removed from the site or stockpiled for reuse as retained soil.

3.4 INSTALLING DRAINAGE SYSTEM

- A. The approved non-woven geotextile shall be set against the back of the first retaining wall unit, over the prepared foundation, and extend towards the back of the excavation, up the excavation face and back over the top of the infill soil to the retaining wall, or as shown in the Construction Drawings.
- B. The drainage pipe shall be placed behind the levelling base, or lower course of facing units as shown in the Construction Drawings or as directed by the Engineer. The pipe shall be laid at a minimum gradient of 2% to ensure adequate drainage to free outlets.
- C. T - Sections and outlet pipes shall be installed on the drainage pipe at 15 m (50 ft.) centers or as shown on the Construction Drawings.
- D. The remaining length of geotextile shall be pulled taut and pinned over the face of the retained soil. Geotextile overlaps shall be a minimum of 300-mm (1-ft.) and shall be shingled down the face of the excavation in order to prevent the infiltration of retained soil into the wall infill.

3.5 LEVELLING BASE OR SPREAD FOOTING PLACEMENT

- A. The levelling base material shall be crushed stone compacted to 98% Standard Proctor Density, or vibrated concrete along the grades and dimensions shown on the Construction Drawings or as directed by the Engineer. The minimum thickness of the levelling base shall be 185 mm (7.25 inches).

3.6 INSTALLATION OF MODULAR CONCRETE RETAINING WALL UNITS

- A. The bottom row of retaining wall modules shall be placed on the prepared levelling base as shown on the Construction Drawings. Care shall be taken to ensure that the wall modules are aligned properly, levelled from side to side and front to back and are in complete contact with the base material.
- B. The wall modules above the bottom course shall be placed such that the tongue and groove arrangement provides the design batter (i.e. setback) of the wall face. Successive courses shall be placed to create a running bond pattern with the edge of all units being approximately aligned with the middle of the unit in the course below it.
- C. The wall modules shall be swept clean before placing additional levels to ensure that no dirt, concrete or other foreign materials become lodged between successive lifts of the wall modules.
- D. A maximum of 3 courses of wall units can be placed above the level of the infill soil at any time.
- E. The contractor shall check the level of wall modules with each lift to ensure that no gaps are formed between successive lifts that may affect the pullout resistance of geogrid reinforcement, if applicable.
- F. Care shall be taken to ensure that the wall modules and geosynthetic reinforcement are not broken or damaged during handling and placement.

3.7 DRAINAGE SOIL

- A. The drainage soil will be placed behind the retaining wall modules with a minimum width of 300 mm (1 ft.) and separated from other soils using the approved non-woven geotextile.
- B. Drainage soil shall be placed behind the wall facing in maximum lifts of 6 inches and compacted to a minimum density of 95% Standard Proctor.
- C. No heavy compaction equipment shall be allowed within 1 metre (3 ft.) of the back of the wall fascia.

3.8 INFILL SOIL

- A. Wall infill soil shall be placed behind the first course of the wall facing units in maximum lifts of 150 mm (6 inches) and compacted to a minimum density of 95% Standard Proctor. At the specified elevations, geogrid reinforcement shall be placed, as described in section 4.09. The fill shall be placed and compacted level with the top of the wall modules at the specified geogrid elevations prior to placing the geogrid reinforcement.
- B. Wall infill soil shall be placed on top of the geogrid reinforcement layers in maximum lifts of 150 mm (6 inches) and compacted to a minimum of 95% Standard Proctor Density. Care shall be taken to ensure that the geogrid lays flat and taut during placement of the infill soil. This is best achieved by placing fill on top of the geogrid near the wall fascia and spreading toward the back of the infill soil zone.
- C. No tracked construction equipment shall be allowed to operate directly on top of the geogrid until a minimum thickness of 150 mm (6 inches) of fill has been placed. Rubber tired equipment may drive on top of the geogrid at slow speeds but should exercise care not to stop suddenly or make sharp turns. No heavy equipment shall be allowed within 1 meter (3 ft.) of the back of the wall.

3.9 GEOGRID SOIL REINFORCEMENT

- A. Pre-cut sections of geogrid reinforcement shall be placed horizontally at the specified elevations and with longitudinal axis perpendicular to the wall face (i.e. machine direction), at the elevations shown on the Construction Drawings, or as directed by the Engineer.
- B. The geogrid shall be placed over the compacted infill soil and the wall facing units with the outside edge extending over the tongue of the bottom unit and to within 25 mm (1 in.) of the front facing unit. Care shall be taken to ensure that the wall modules are swept clean and that the geogrid is in complete contact with the top and bottom faces of the adjacent wall modules. The next course of wall modules shall be carefully placed on top of the lower modules to ensure that no pieces of concrete are chipped off and become lodged between unit layers.
- C. The geogrid shall be pulled taut away from the back the wall modules during placement of infill soil. Alternatively, suitable anchoring pins or staples can be used to ensure that there are no wrinkles or slackness prior to placement of the infill soil. The geogrid shall lay perfectly flat when pulled back perpendicular to the back of the wall fascia.

3.10 RETAINED SOIL

- A. Retained soils shall be placed and compacted behind the infill soil or drainage soil if applicable, in maximum lift thickness of 150 mm (6 inches). The retained soils shall be undisturbed native material or engineered fill compacted to a minimum density of 95% Standard Proctor.
- B. No heavy compaction equipment shall be allowed within 1 m (3 ft.) of the back of the wall modules.

3.11 FINISHING WALL

- A. Items 3.05 to 3.10 shall be repeated until the grades indicated on the Construction Drawings are achieved.
- B. Coping units shall be secured to the top of the wall with two 10 mm (3/8 inch) beads of the approved flexible concrete adhesive positioned 50mm (2 inches) in front and behind the tongue of the last course of retaining wall units.
- C. Finish grading above the wall to direct surface run off water away from the segmental retaining wall. Use a soil with a low permeability to restrict the rate of water infiltration into the retaining wall structure.

END OF SECTION 32 3223