ADDENDUM NO. 2

February 17, 2025

IPS: Joyce Kilmer New School 69
3421 N. Keystone Avenue
Indianapolis, IN 46218

TO: ALL BIDDERS OF RECORD

This Addendum forms a part of and modifies the Bidding Requirements, Contract Forms, Contract Conditions, the Specifications, and the Drawings dated January 17, 2025, by Meticulous Design + Architecture. Acknowledge receipt of the Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

This Addendum consists of Pages ADD 2-1 through ADD 2-2, Guideline Schedule, and attached Meticulous Design + Architecture Addendum No 2, dated February 17, 2025, consisting of two (2) pages, Revised Specification Sections: 087100 – Door Hardware, 096519 – Resilient Tile Flooring, 123213 – Manufactured Wood-Veneer-Faced Casework, 221313 – Facility Sanitary Sewers (Site), 232123 – Hydronic Pumps, 260533 – Raceways and Boxes for Electrical Systems, 311000 – Site Clearing, 312000 - Earth Moving, 321216 – Asphalt Paving, 321313 Concrete Paving, 321373 – Concrete Paving Joint Sealants, 329119 – Landscape Grading, 329219 – Seeding, 329300 – Plants, 329443 – Tree Grates and Frames, 334100 – Storm Utility Drainage Piping, 334419.15 – Stormwater Hydrodynamic Grit Separator, and Addendum 2 Drawing Sheets: G000, I-471, K101, K200, K300, EL-112A, E-601, MH-112A, P-502, T-501, and T-502.

A. SPECIFICATION SECTION 01 12 00 – MULTIPLE CONTRACT SUMMARY

1. **Paragraph 3.03 Bid Categories**

A. BID CATEGORY NO. 2 – GENERAL TRADES

Add the following:

Bollards Per Note 14 on Sheet CS-101 – Details to be issued by Addendum No. 3.
Bike Racks – Per Note 22 on Sheet CS-101 and Details Shown on Sheet CS-501.

Delete the following Specification Section (From Addendum 1)

312000 - Earth Moving
334100 – Storm Utility Drainage Piping
334419.15 – Stormwater Hydrodynamic Grit Separator

N. **BID CATEGORY NO. 15 – EARTHWORK/SITE UTILITIES**

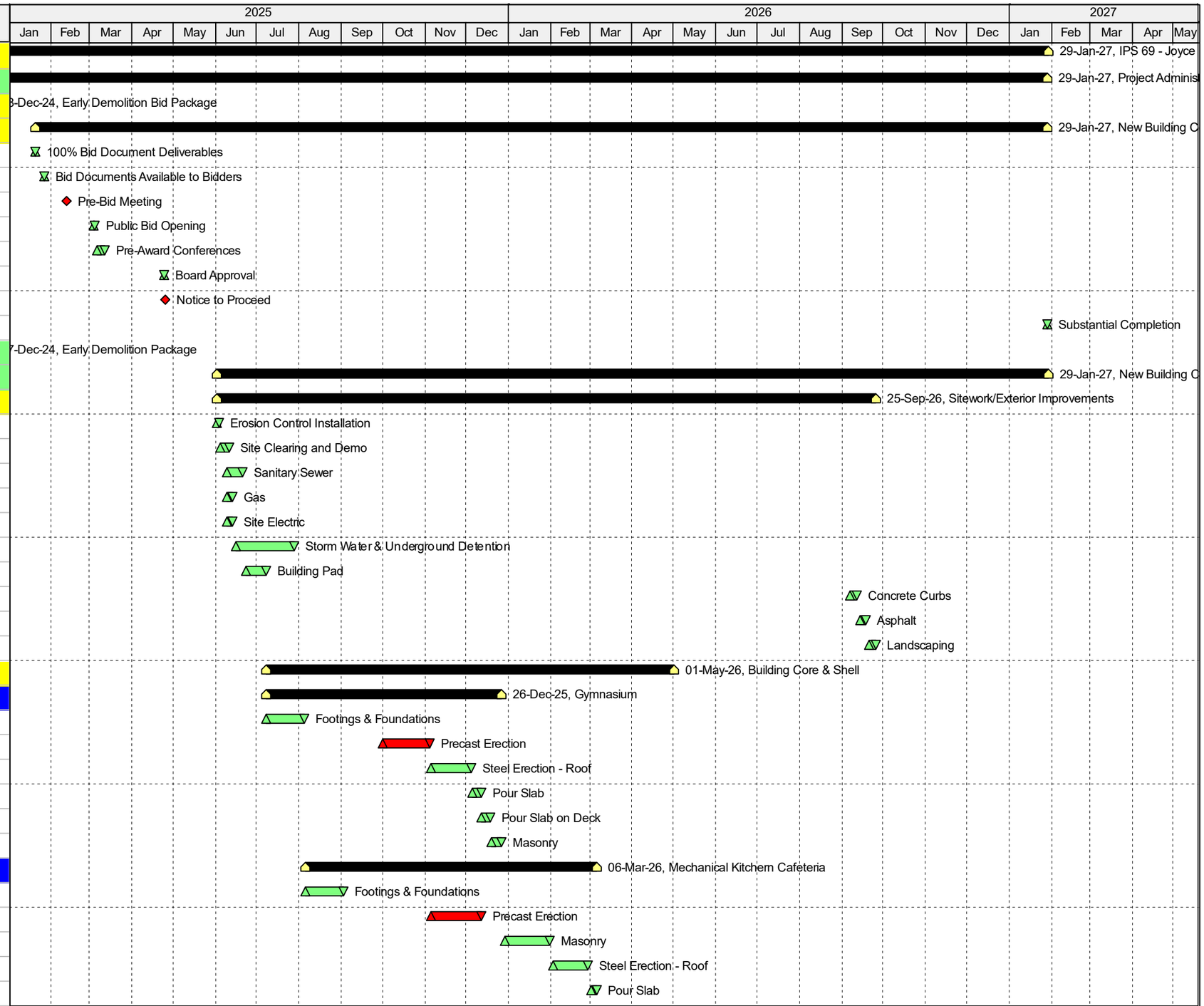
Add the following Specification Sections:

312000 - Earth Moving
329119 – Landscape Grading
334100 – Storm Utility Drainage Piping
334419.15 – Stormwater Hydrodynamic Grit Separator

B. **SPECIFICATION SECTION 01 32 00 – SCHEDULES AND REPORTS**

1. The Guideline Schedule is attached herein Updated Guideline Schedule that was issued in Addendum 1.

Activity Name	Original Duration	Start	Finish
IPS 69 - Joyce Kilmer Elementary Schoo	717	15-Apr-24	29-Jan-27
Project Administration	716	15-Apr-24	29-Jan-27
Early Demolition Bid Package	172	15-Apr-24	18-Dec-24
New Building Construction Bid Package	523	20-Jan-25	29-Jan-27
100% Bid Document Deliverables	0	20-Jan-25*	20-Jan-25
Bid Documents Available to Bidders	0	27-Jan-25	27-Jan-25
Pre-Bid Meeting	0	12-Feb-25*	
Public Bid Opening	1	04-Mar-25*	04-Mar-25
Pre-Award Conferences	5	06-Mar-25*	12-Mar-25
Board Approval	0	24-Apr-25*	24-Apr-25
Notice to Proceed	0	25-Apr-25	
Substantial Completion	0	29-Jan-27*	29-Jan-27
Early Demolition Package	65	16-Sep-24	17-Dec-24
New Building Construction	430	02-Jun-25	29-Jan-27
Sitework/Exterior Improvements	340	02-Jun-25	25-Sep-26
Erosion Control Installation	2	02-Jun-25*	03-Jun-25
Site Clearing and Demo	5	04-Jun-25*	10-Jun-25
Sanitary Sewer	10	09-Jun-25*	20-Jun-25
Gas	5	09-Jun-25*	13-Jun-25
Site Electric	5	09-Jun-25*	13-Jun-25
Storm Water & Underground Detention	30	16-Jun-25*	28-Jul-25
Building Pad	10	23-Jun-25*	07-Jul-25
Concrete Curbs	5	07-Sep-26*	11-Sep-26
Asphalt	5	14-Sep-26*	18-Sep-26
Landscaping	5	21-Sep-26*	25-Sep-26
Building Core & Shell	210	08-Jul-25	01-May-26
Gymnasium	120	08-Jul-25	26-Dec-25
Footings & Foundations	20	08-Jul-25	04-Aug-25
Precast Erection	25	01-Oct-25*	04-Nov-25
Steel Erection - Roof	20	05-Nov-25	04-Dec-25
Pour Slab	5	05-Dec-25	11-Dec-25
Pour Slab on Deck	5	12-Dec-25	18-Dec-25
Masonry	5	19-Dec-25	26-Dec-25
Mechanical Kitchern Cafeteria	150	05-Aug-25	06-Mar-26
Footings & Foundations	20	05-Aug-25	02-Sep-25
Precast Erection	25	05-Nov-25	11-Dec-25
Masonry	25	29-Dec-25	30-Jan-26
Steel Erection - Roof	20	02-Feb-26	27-Feb-26
Pour Slab	5	02-Mar-26	06-Mar-26

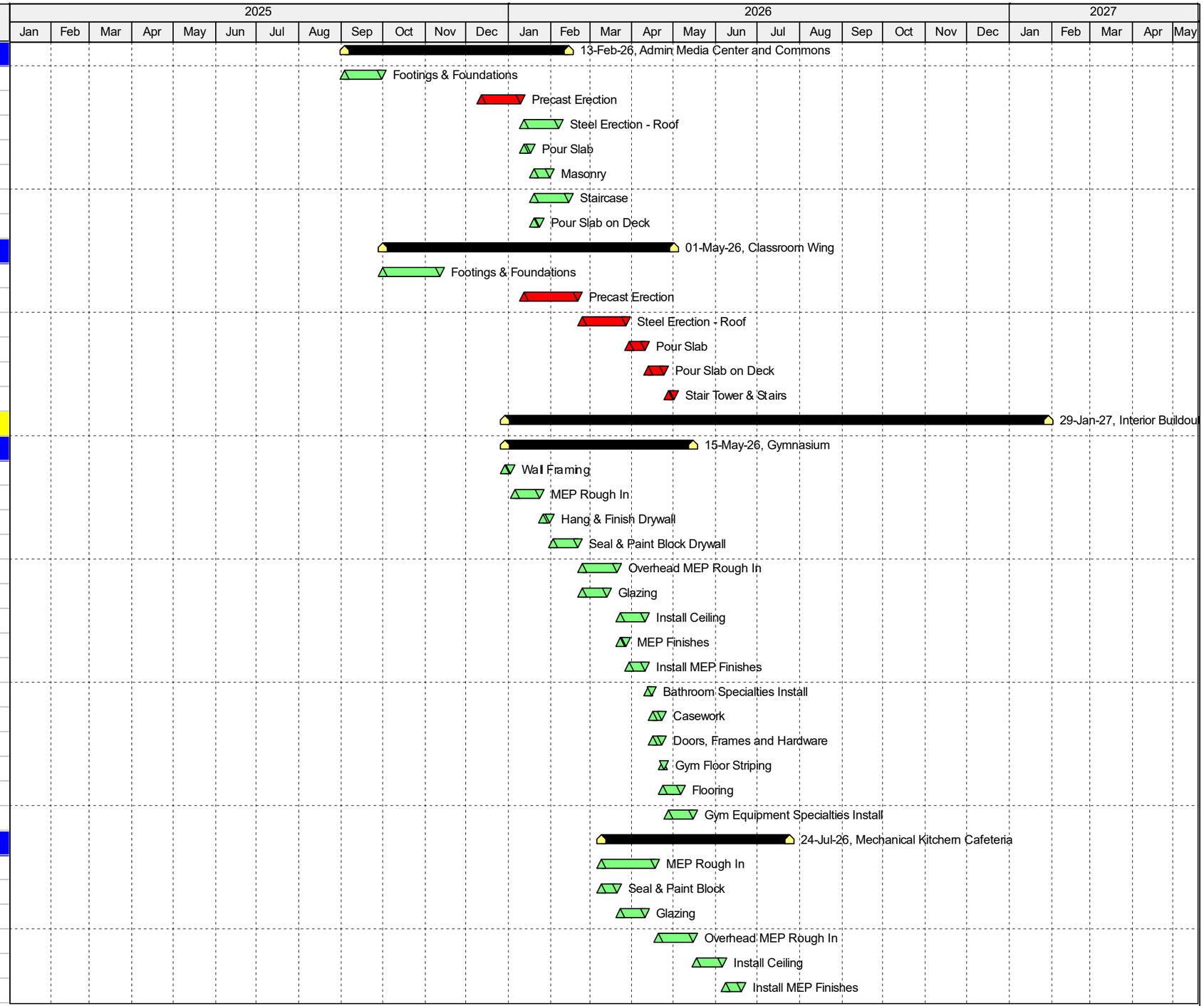


Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

IPS 69 - Joyce Kilmer Elementary School
Guideline Schedule - 02.17.25

The SKILLMAN Corporation
AN EMPLOYEE-OWNED COMPANY

Activity Name	Original Duration	Start	Finish
Admin Media Center and Commons	115	03-Sep-25	13-Feb-26
Footings & Foundations	20	03-Sep-25	30-Sep-25
Precast Erection	20	12-Dec-25	09-Jan-26
Steel Erection - Roof	20	12-Jan-26	06-Feb-26
Pour Slab	5	12-Jan-26	16-Jan-26
Masonry	10	19-Jan-26	30-Jan-26
Staircase	20	19-Jan-26	13-Feb-26
Pour Slab on Deck	5	19-Jan-26	23-Jan-26
Classroom Wing	150	01-Oct-25	01-May-26
Footings & Foundations	30	01-Oct-25	11-Nov-25
Precast Erection	30	12-Jan-26	20-Feb-26
Steel Erection - Roof	25	23-Feb-26	27-Mar-26
Pour Slab	10	30-Mar-26	10-Apr-26
Pour Slab on Deck	10	13-Apr-26	24-Apr-26
Stair Tower & Stairs	5	27-Apr-26	01-May-26
Interior Buildout	285	29-Dec-25	29-Jan-27
Gymnasium	100	29-Dec-25	15-May-26
Wall Framing	5	29-Dec-25	02-Jan-26
MEP Rough In	15	05-Jan-26	23-Jan-26
Hang & Finish Drywall	5	26-Jan-26	30-Jan-26
Seal & Paint Block Drywall	15	02-Feb-26	20-Feb-26
Overhead MEP Rough In	20	23-Feb-26	20-Mar-26
Glazing	15	23-Feb-26	13-Mar-26
Install Ceiling	15	23-Mar-26	10-Apr-26
MEP Finishes	5	23-Mar-26	27-Mar-26
Install MEP Finishes	10	30-Mar-26	10-Apr-26
Bathroom Specialties Install	3	13-Apr-26	15-Apr-26
Casework	5	16-Apr-26	22-Apr-26
Doors, Frames and Hardware	5	16-Apr-26	22-Apr-26
Gym Floor Striping	2	23-Apr-26	24-Apr-26
Flooring	10	23-Apr-26	06-May-26
Gym Equipment Specialties Install	15	27-Apr-26	15-May-26
Mechanical Kitchern Cafeteria	100	09-Mar-26	24-Jul-26
MEP Rough In	30	09-Mar-26	17-Apr-26
Seal & Paint Block	10	09-Mar-26	20-Mar-26
Glazing	15	23-Mar-26	10-Apr-26
Overhead MEP Rough In	20	20-Apr-26	15-May-26
Install Ceiling	15	18-May-26	05-Jun-26
Install MEP Finishes	10	08-Jun-26	19-Jun-26

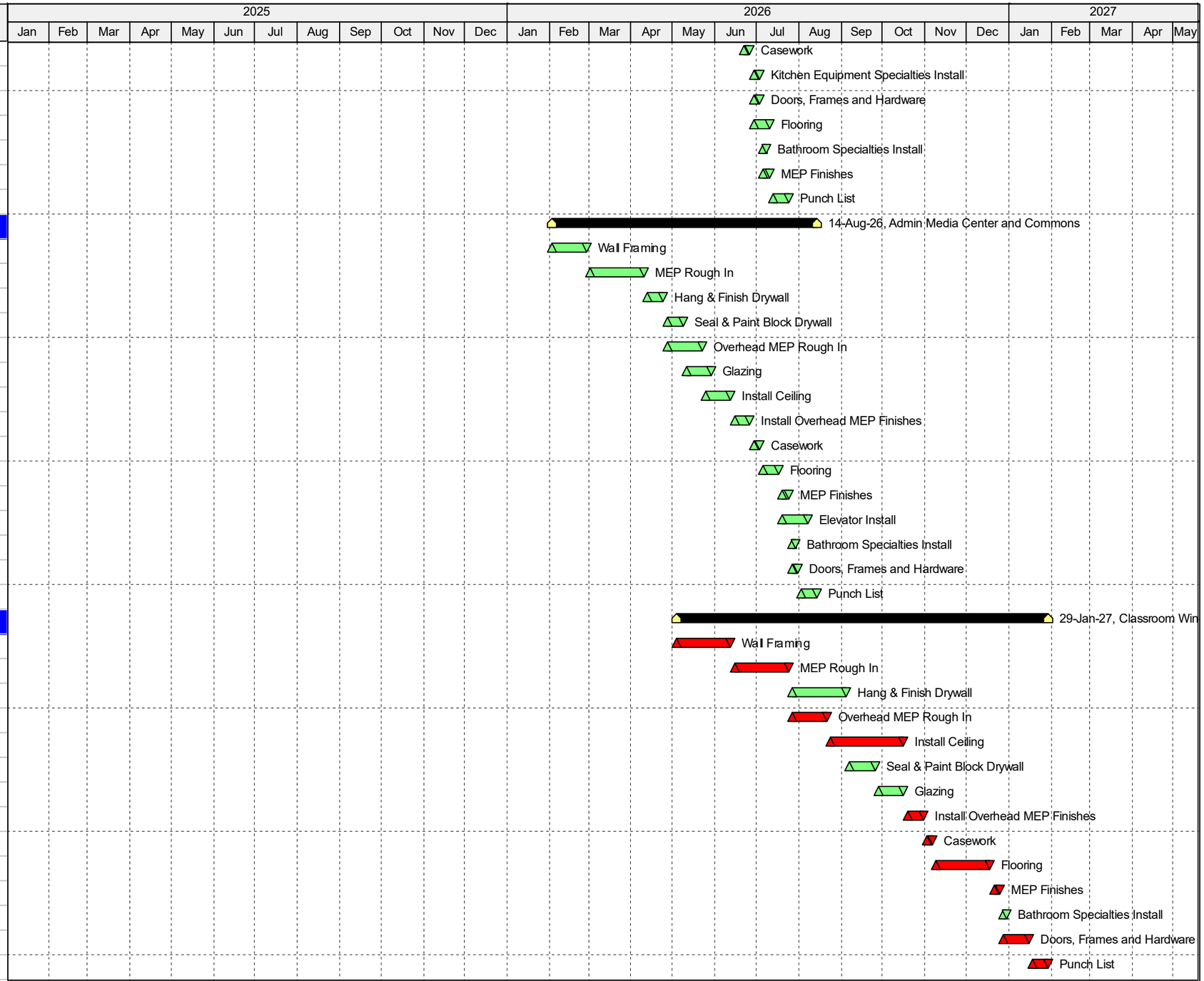


Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

IPS 69 - Joyce Kilmer Elementary School
Guideline Schedule - 02.17.25

The SKILLMAN Corporation
AN EMPLOYEE-OWNED COMPANY

Activity Name	Original Duration	Start	Finish
Casework	5	22-Jun-26	26-Jun-26
Kitchen Equipment Specialties Install	5	29-Jun-26	03-Jul-26
Doors, Frames and Hardware	5	29-Jun-26	03-Jul-26
Flooring	10	29-Jun-26	10-Jul-26
Bathroom Specialties Install	3	06-Jul-26	08-Jul-26
MEP Finishes	5	06-Jul-26	10-Jul-26
Punch List	10	13-Jul-26	24-Jul-26
Admin Media Center and Commons	140	02-Feb-26	14-Aug-26
Wall Framing	20	02-Feb-26	27-Feb-26
MEP Rough In	30	02-Mar-26	10-Apr-26
Hang & Finish Drywall	10	13-Apr-26	24-Apr-26
Seal & Paint Block Drywall	10	27-Apr-26	08-May-26
Overhead MEP Rough In	20	27-Apr-26	22-May-26
Glazing	15	11-May-26	29-May-26
Install Ceiling	15	25-May-26	12-Jun-26
Install Overhead MEP Finishes	10	15-Jun-26	26-Jun-26
Casework	5	29-Jun-26	03-Jul-26
Flooring	10	06-Jul-26	17-Jul-26
MEP Finishes	5	20-Jul-26	24-Jul-26
Elevator Install	15	20-Jul-26	07-Aug-26
Bathroom Specialties Install	3	27-Jul-26	29-Jul-26
Doors, Frames and Hardware	5	27-Jul-26	31-Jul-26
Punch List	10	03-Aug-26	14-Aug-26
Classroom Wing	195	04-May-26	29-Jan-27
Wall Framing	30	04-May-26	12-Jun-26
MEP Rough In	30	15-Jun-26	24-Jul-26
Hang & Finish Drywall	30	27-Jul-26	04-Sep-26
Overhead MEP Rough In	20	27-Jul-26	21-Aug-26
Install Ceiling	40	24-Aug-26	16-Oct-26
Seal & Paint Block Drywall	15	07-Sep-26	25-Sep-26
Glazing	15	28-Sep-26	16-Oct-26
Install Overhead MEP Finishes	10	19-Oct-26	30-Oct-26
Casework	5	02-Nov-26	06-Nov-26
Flooring	30	09-Nov-26	18-Dec-26
MEP Finishes	5	21-Dec-26	25-Dec-26
Bathroom Specialties Install	3	28-Dec-26	30-Dec-26
Doors, Frames and Hardware	15	28-Dec-26	15-Jan-27
Punch List	10	18-Jan-27	29-Jan-27



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IPS 69 - Joyce Kilmer Elementary School
Guideline Schedule - 02.17.25

The SKILLMAN Corporation
AN EMPLOYEE-OWNED COMPANY

TRANSMITTAL

METICULOUS DESIGN + ARCHITECTURE

IPS Joyce Kilmer 69
ADDENDUM 2 DRAWINGS AND SPECIFICATIONS
2/17/25

SPECIFICATIONS

1. Revised Project Manual Cover Page to include standard IPS information and Addenda
2. Revised 000110 - TABLE OF CONTENTS
    a. To indicate additions, deletions, and revisions to various SECTIONS.
        i. Deleted 064113 WOOD-VENEER-FACED ARCHITECTURAL CABINETS
        ii. Deleted 074213.23 METAL COMPOSITE MATERIAL WALL PANELS
        iii. Deleted 238219 FAN COIL UNITS
        iv. Deleted 238236 FINNED-TUBE RADIATION HEATERS
        v. Deleted 273125 VOICE OVER IP TELEPHONE SYSTEM
        vi. Deleted 274116 INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT
        vii. Deleted 329200 TURF AND GRASSES
        viii. Added 123213 MANUFACTURED WOOD-VENEER-FACED CASEWORK
        ix. Added Section Name 262413 SWITCHBOARDS
        x. Added Section Name 329119 LANDSCAPE GRADING
        xi. Added Section Name 329219 SEEDING
        xii. Added Section Name 329443 TREE GRATES AND FRAMES
3. Revised SECTION 087100 DOOR HARWARE
    a. Added page 46 listing Door numbers with corresponding Hardware Group numbers.
4. Revised SECTION 096519 RESILIENT TILE FLOORING
    a. Revised Paragraph 1.5.A.1. to read, "1. Floor Tile: Furnish equal to four percent (4%) full-sized materials thereof, of each type, color, and pattern of floor tile installed."
5. Revised SECTION 232123 – HYDRONIC PUMPS
    a. Added a manufacturer back to the spec.
6. Revised SECTION 260533 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
    a. 3.1(B)(4) to clarify that while FMC is allowable when concealed in ceilings and interior walls and partitions, MC cable is preferred, and all Communications systems requiring conduit are to be installed in EMT.
7. Added the following SECTIONS:
    a. 123213 MANUFACTURED WOOD-VENEER-FACED CASEWORK
    b. 221313 FACILITY SANITARY SEWERS (SITE)
    c. 311000 SITE CLEARING
    d. 312000 EARTH MOVING
    e. 321216 ASPHALT PAVING
    f. 321313 CONCRETE PAVING
    g. 321373 CONCRETE PAVING JOINT SEALANTS
    h. 334100 STORM UTILITY DRAINAGE PIPING
    i. 334419.15 STORMWATER HYDRODYNAMIC GRIT SEPARATOR

DRAWINGS

1. Revised sheet G-000 Cover Sheet
    a. Updated Sheet Index
2. Revised sheet I-471 CASEWORK DETAILS
    a. Revised all references to solid wood:
        i. General Notes "I"
        ii. Details 3 and 4
3. Revised FOODSERVICE drawings to indicate Equipment Not In Contract
    a. K-101 – FOODSERVICE LAYOUT
    b. K-200 – FOODSERVICE EQUIPMENT SCHEDULE
    c. K-300 – FOODSERVICE PLUMBING & ELECTRICAL LAYOUT

4. Revised MECHANICAL, ELECTRICAL, AND PLUMBING drawings:
    a. EL-112A – 02 FLOOR LIGHTING PLAN – AREA A
        i. Revised lighting in the media center and high ceiling portion of the cafeteria per owner direction.
    b. E-601 – ELECTRICAL SCHEDULES
        i. Revised lighting fixture schedule to reflect new types.
    c. MH-112A – 02 FLOOR MECHANICAL HVAC PLAN – AREA A
        i. Revised diffuser layout to accommodate new lighting layout.
    d. P-502 – PLUMBING DETAILS
        i. Added sheet.
    e. T-501 – TECHNOLOGY DETAILS
        i. Revised notes on detail 1, detail 2, detail 4, detail 5 and detail 6.
    f. T-502 – TECHNOLOGY DETAILS
        i. Revised notes on detail 1 and detail 2.

END OF ADDENDUM

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components
3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

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 Section "Alternates" for alternates affecting this section.
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. "Metal Doors and Frames"
    b. "Flush Wood Doors"
    c. "Aluminum-Framed Entrances and Storefronts"
6. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
7. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
8. 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. Review drawings and Sections from related trades to verify compatibility with specified hardware.
    b. 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. 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.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. 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.

E. 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.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.6 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.

1.7 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: 10 Years
2) Exit Devices: 10 Years
3) Closers: 30 Years

b. Electrical Warranty

1) Locks: 3 Years
2) Exit Devices: 3 Years
3) Automatic Operators: 2 Years

1.8 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 manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

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. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. 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.
2. For closers and panic devices: Verify with Architect and/or Owner if thru-bolts are required at specific door materials.

2.3 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product.
    a. Ives 5BB series
2. Acceptable Manufacturers and Products:
    a. Hager BB series
    b. McKinney TB series
    c. Stanley (Best/Dormakaba) FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. Hinge Height:
    a. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide: 4-1/2 inches (114 mm) high
    b. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide: 5 inches (127 mm) high
    c. 2 inches or thicker doors: 5 inches (127 mm) high, regardless of door width
4. Hinge Width: 4-1/2 inches (114 mm) wide typical. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
5. Hinge quantity: Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
    a. Steel Hinges: Steel pins
    b. Non-Ferrous Hinges: Stainless steel pins
    c. Out-Swinging Exterior Doors: Non-removable pins
    d. Out-Swinging Interior Lockable Doors: Non-removable pins
    e. Interior Non-lockable Doors: Non-rising pins
7. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

8. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.

2.4 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives
2. Acceptable Manufacturers:
   a. Select
   b. Pemko

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.
8. Adjust hinge model/width as required for door thickness or construction

2.5 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.

2.6 FLUSH BOLTS

A. Manufacturers:

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

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.

2.7 COORDINATORS

A. Manufacturers:

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

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

2.8 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

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

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
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 cast levers without plastic inserts and wrought roses on both sides.
    a. Lever Design: Schlage Rhodes (RHO).

2.9 MORTISE LOCKS AND DEADBOLTS (AT LOCKS WITH INDICATORS)

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-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
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. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
    a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
    b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
    c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
    d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
    e. Connections – provide quick-connect Molex system standard.

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. Lever Design: Schlage 06B.

2.10 DEADBOLTS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. Schlage B6000 Series
2. Acceptable Manufacturers and Products:
    a. No Substitute

B. Requirements:

1. Provide grade 1 deadbolt series conforming to ANSI/BHMA A156.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide deadbolts with standard 2-3/4 inches (70 mm) backset. Provide 2-3/8 inches (60 mm) where noted or if door or frame detail requires. Provide deadbolt with full 1-inch (25 mm) throw, constructed of steel alloy.
4. Provide manufacturer's standard strike.

2.11 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. Von Duprin 99 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 grooved 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.

2.12 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.

2.13 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. Schlage/Von Duprin PS900 Series
2. Acceptable Manufacturers and Products:
    a. No Substitute

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:

a. 12/24 VDC Output, field selectable.
b. Class 2 Rated power limited output.
c. Universal 120-240 VAC input.
d. Low voltage DC, regulated and filtered.
e. Polarized connector for distribution boards.
f. Fused primary input.
g. AC input and DC output monitoring circuit w/LED indicators.
h. Cover mounted AC Input indication.
i. Tested and certified to meet UL294.
j. NEMA 1 enclosure.
k. Hinged cover w/lock down screws.
l. High voltage protective cover.

2.14 CYLINDERS

A. Manufacturers:

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

B. Requirements:

1. Provide cylinders/cores to match Owner’s existing key system, 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 cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
   a. Match owner's existing system.
   b. Cylinder/Core Type:
      1) Small Format Interchangeable Core (SFIC)
3. Replaceable Construction Cores.
   a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
      1) 3 construction control keys
      2) 12 construction change (day) keys.
4. Verify with Owner where permanent cores are to be shipped to.

2.15 KEYING

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Provide keying system capable of multiplex masterkeying.
2. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.

a. Master Keying system as directed by the Owner.
b. Match Owner's existing system.
c. (Great)Grand Master Key System: Cylinders/cores operated by change(day) keys and subsequent masters (including grand/great grand) keys.

3. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
4. Provide keys with the following features:
   a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
   b. Keyway Security Type:
      1) Restricted/Patented
5. Identification:
   a. Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
   b. Identification stamping provisions must be approved by the Architect and Owner.
   c. Stamp cylinders/cores and keys with Owner’s unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with “DO NOT DUPLICATE” along with the “PATENTED” or patent number to enforce the patent protection.
   d. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
6. Quantity: Furnish in the following quantities.
   a. Change (Day) Keys: 3 per cylinder/core.
   b. Permanent Control Keys: 3 (only applicable to interchangeable core).
   c. Master Keys: 6/ea (per master).
   d. Unused balance of key blanks shall be provided to Owner with cut keys.
7. Verify with Owner where permanent keys are to be shipped to.

2.16 KEY CONTROL SYSTEM

A. Manufacturers:
1. Scheduled Manufacturer:
   a. Telkee
2. Acceptable Manufacturers:
   a. HPC
   b. Lund

B. Requirements:
1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
   a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
   b. Provide hinged-panel type cabinet for wall mounting.

2.17 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. LCN 4040XP 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. 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 piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
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. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
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 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.

2.18 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
    a. LCN 4600 series
2. Acceptable Manufacturers and Products:
    a. No Substitute

B. Requirements:

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.

2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
5. Provide drop plates, brackets, and adapters for arms as required for details.
6. Provide actuator switches and receivers for operation as specified.
7. Provide weather-resistant actuators at exterior applications.
8. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.
9. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
10. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.19 DOOR TRIM

A. Manufacturers:

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

B. Requirements:

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

2.20 PROTECTION PLATES

A. Manufacturers:

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

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes kick and armor plates 1 1/2 inches (51 mm) less width of door on single doors, and 1 inch (25 mm) less width of door on pairs. Adjust width at doors with mullions, edge guards, gasketing or other conflicting hardware.
3. Size mop plates 1" less width of door. Adjust width as needed for edge guards or other conflicting hardware.
4. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.21 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. Provide friction type at doors without closer and positive type at doors with closer.

2.22 DOOR STOPS AND HOLDERS

A. Manufacturers:

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

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.23 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
c. Pemko

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.

2.24 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Rockwood
b. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.25 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders at Exterior Doors: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Weatherstripping: Clear Anodized Aluminum
9. Thresholds: Mill Finish Aluminum

B. FRP DOOR HARDWARE FINISH: BHMA 613/640 (US10B); EXCEPT:

1. Door Closers: Powder Coat to Match.
2. Weatherstripping: Dark Bronze Anodized Aluminum.

3. Thresholds: Mill Finish Aluminum

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 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing doors and frames for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
    a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 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. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. 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.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

P. 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.

Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 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. ***Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. ***Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. 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.

3.5 CLEANING AND PROTECTION

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:

124354 OPT0400466 Version 1

Hardware Group No. 01

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	710	IVE
2	EA	DUMMY PUSH BAR	330	313	VON
2	EA	FLUSH PULL	BY DOOR MANUFACTURER		B/O
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
2	EA	MOUNTING PLATE	4040XP-18PA	695	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	695	LCN
2	EA	BLADE STOP SPACER	4040XP-61	695	LCN
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O

Hardware Group No. 02

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	710	IVE
1	EA	CONT. HINGE	224XY EPT	710	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	AUTO FLUSH BOLT	FB31T/FB41T (AS REQ'D)	613	IVE
1	EA	VANDL EU STOREROOM	ND96HDEU RHO CON 12V/24V DC	613	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	613	SCH
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	711	IVE
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	613	IVE
1	EA	RAIN DRIP	142D (IF EXPOSED ABOVE)	D	ZER
1	SET	GASKETING	328AA-S JAMB SEAL	D	ZER
1	EA	GASKETING	429AA -HEAD SEAL	D	ZER
2	EA	DOOR SWEEP, BRUSH W/ DRIP	8198D	D	ZER
1	EA	THRESHOLD, 1/2"	655D	D	ZER
2	EA	DOOR CONTACT	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY ACCESS CONTROL INTEGRATOR		B/O
1	EA	POWER SUPPLY	PS914 120/240 VAC		VON

VERIFY/COORDINATE PREPS ON EXISTING FRAMES. PROVIDE FIELD MODIFICATIONS AND/OR FILLERS TO EXISTING FRAMES AS NECESSARY TO ACCEPT NEW SPECIFIED HARDWARE.

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER, WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 03

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	OH STOP	450S	652	GLY
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 04

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 05

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP REG TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 06

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 07

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	OFFICE W/SIM RETRACT W/ OUTSIDE INDICATOR	L9056BDC 06B L583-363 OS-OCC	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP REG TBMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 08

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	ND80BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	OH STOP	450S	652	GLY
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 09

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	ND80BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 10

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	710	IVE
1	EA	VANDL STOREROOM LOCK	ND96BDC RHO	613	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	613	SCH
1	EA	ELECTRIC STRIKE	6400 FSE 12/24 VAC/VDC	630	VON
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC	695	LCN
2	EA	ACTUATOR	8310-818T	630	LCN
1	EA	WALL STOP	WS406/407CVX	613	IVE
1	EA	DOOR CONTACT	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY ACCESS CONTROL INTEGRATOR		B/O
1	EA	DESK MOUNT BUTTON	660-PB	628	SCE
1	EA	POWER SUPPLY	PS914 900-4R 120/240 VAC		VON

DOOR(S) NORMALLY CLOSED AND LOCKED AND EXTERIOR ACTUATOR DISABLED. PRESENTING VALID CREDENTIAL TO READER, OR PUSH BUTTON AT RECEPTION DESK, MOMENTARILY RELEASES ELECTRIC STRIKE AND ENABLES EXTERIOR ACTUATOR BUTTON. PUSHING ENABLED EXTERIOR ACTUATOR BUTTON SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. INTERIOR ACTUATOR ENABLED AT ALL TIMES. PUSHING THE INTERIOR ACTUATOR BUTTON RELEASES ELECTRIC STRIKE AND SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. ELECTRIC STRIKE ALSO CAPABLE OF BEING HELD IN AN RELEASED STATE (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. ELECTRIC STRIKE LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 11

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL STOREROOM LOCK	ND96BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 12

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC LOCK	ND96HDEU RHO 12V/24V DC	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	DOOR CONTACT	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY ACCESS CONTROL INTEGRATOR		B/O
1	EA	POWER SUPPLY	PS914 120/240 VAC		VON

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER, WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 13

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	710	IVE
1	EA	CONT. HINGE	224XY EPT	710	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	AUTO FLUSH BOLT	FB31T/FB41T (AS REQ'D)	613	IVE
1	EA	VANDL EU STOREROOM	ND96HDEU RHO CON 12V/24V DC	613	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	613	SCH
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	711	IVE
2	EA	SURFACE CLOSER	4040XP HCUSH TBWMS	695	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	613	IVE
1	EA	RAIN DRIP	142D (IF EXPOSED ABOVE)	D	ZER
1	SET	GASKETING	328AA-S JAMB SEAL	D	ZER
1	EA	GASKETING	429AA -HEAD SEAL	D	ZER
2	EA	DOOR SWEEP, BRUSH W/ DRIP	8198D	D	ZER
1	EA	THRESHOLD, 1/2"	655D	D	ZER
2	EA	DOOR CONTACT	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY ACCESS CONTROL INTEGRATOR		B/O
1	EA	POWER SUPPLY	PS914 120/240 VAC		VON

VERIFY/COORDINATE PREPS ON EXISTING FRAMES. PROVIDE FIELD MODIFICATIONS AND/OR FILLERS TO EXISTING FRAMES AS NECESSARY TO ACCEPT NEW SPECIFIED HARDWARE.

DOOR NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER, WILL UNLOCK OUTSIDE LEVER, ALLOWING ACCESS. DOOR REMAINS LOCKED WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 14

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	CYL X TURN DEAD LOCK	L460BDC 09-544	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	Cylinder Pull	1874	626	DON
1	EA	OH STOP	450S	652	GLY
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 15

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL STOREROOM LOCK	ND96BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 16

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	AUTO FLUSH BOLT	FB31T/FB41T (AS REQ'D)	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 17

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	710	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	695	VON
2	EA	PANIC HARDWARE	LD-99-EO	626	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	613	SCH
2	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	613	SCH
2	EA	FLUSH PULL	BY DOOR MANUFACTURER		B/O
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
2	EA	MOUNTING PLATE	4040XP-18PA	695	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	695	LCN
2	EA	BLADE STOP SPACER	4040XP-61	695	LCN
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR CONTACT	BY DIV 28		B/O

Hardware Group No. 18

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	710	IVE
1	EA	CONT. HINGE	112XY EPT	710	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	695	VON
1	EA	PANIC HARDWARE	LD-99-EO	313	VON
1	EA	ELEC PANIC HARDWARE	LX-QEL-99-NL-OP-110MD 24 VDC	313	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	613	SCH
1	EA	RIM CYL HOUSING (SFIC)	80-159 (W/ KEYED CONST CORE)	613	SCH
2	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	613	SCH
2	EA	FLUSH PULL	BY DOOR MANUFACTURER		B/O
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC	695	LCN
1	EA	MOUNTING PLATE	4040XP-18PA	695	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	695	LCN
1	EA	BLADE STOP SPACER	4040XP-61	695	LCN
2	EA	ACTUATOR	8310-853T	630	LCN
2	EA	MOUNT BOX	8310-867S		LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
2	EA	DOOR SWEEP, BRUSH W/ DRIP	8198D	D	ZER
1	EA	THRESHOLD, 1/2"	655D	D	ZER
2	EA	DOOR CONTACT	BY DIV 28		B/O
1	EA	POWER SUPPLY	PS914 900-4R 120/240 VAC		VON

DOOR(S) NORMALLY CLOSED AND LOCKED AND EXTERIOR ACTUATOR DISABLED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH AND ENABLES EXTERIOR ACTUATOR. PUSHING ENABLED EXTERIOR ACTUATOR SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. INTERIOR ACTUATOR ENABLED AT ALL TIMES. PUSHING INTERIOR ACTUATOR RETRACTS LATCH AND SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. EXIT DEVICE LATCH ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 19

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	710	IVE
1	EA	CONT. HINGE	112XY EPT	710	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	695	VON
1	EA	PANIC HARDWARE	LD-99-EO	313	VON
1	EA	ELEC PANIC HARDWARE	QEL-99-NL-OP-110MD 24 VDC	313	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	613	SCH
1	EA	RIM CYL HOUSING (SFIC)	80-159 (W/ KEYED CONST CORE)	613	SCH
2	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	613	SCH
2	EA	FLUSH PULL	BY DOOR MANUFACTURER		B/O
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
2	EA	MOUNTING PLATE	4040XP-18PA	695	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	695	LCN
2	EA	BLADE STOP SPACER	4040XP-61	695	LCN
1	EA	RAIN DRIP	142D (IF EXPOSED ABOVE)	D	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
2	EA	DOOR SWEEP, BRUSH W/ DRIP	8198D	D	ZER
1	EA	THRESHOLD, 1/2"	655D	D	ZER
2	EA	DOOR CONTACT	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY ACCESS CONTROL INTEGRATOR		B/O
1	EA	POWER SUPPLY	PS914 900-2RS 120/240 VAC		VON

DOOR(S) NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH, ALLOWING ACCESS. EXIT DEVICE LATCH ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 20

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	LD-99-L-2-06	626	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	626	SCH
2	EA	RIM CYL HOUSING (SFIC)	80-116 (W/ DISP CONST CORE)	626	SCH
2	EA	TTURN RIM CYLINDER	XB13-379	626	SCH
3	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
2	EA	SURFACE CLOSER (W/ DEAD STOP & HO)	4040XP HCUSH TBWMS	689	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 21

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	ND80BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 22

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL STOREROOM LOCK	ND96BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP REG TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 23

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	LD-99-L-2-06	626	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	626	SCH
2	EA	RIM CYL HOUSING (SFIC)	80-116 (W/ DISP CONST CORE)	626	SCH
2	EA	TTURN RIM CYLINDER	XB13-379	626	SCH
3	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
2	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
2	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 24

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL OFFICE LOCK	ND91BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	OH STOP	90S	689	GLY
1	EA	SURFACE CLOSER	4040XP REG TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 25

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	PRIVACY LOCK (W/ COIN TURN & IND)	L9044 06B L583-363 OS-OCC	626	SCH
1	EA	OH STOP	450S	652	GLY
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 26

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	AUTO FLUSH BOLT	FB31T/FB41T (AS REQ'D)	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	COORDINATOR	COR X FL (MB AS REQ'D)	628	IVE
2	EA	SURFACE CLOSER	4040XP REG TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CVX	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 27

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
1	EA	FIRE RATED REMOVABLE MULLION	KR9954	689	VON
2	EA	FIRE EXIT HARDWARE	99-EO-F	626	VON
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER

Hardware Group No. 28

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
2	EA	OH STOP	90S	689	GLY
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 29

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	STOREROOM LOCK	ND80BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP REG TBMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

Hardware Group No. 30

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	STOREROOM LOCK	ND80BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	OH STOP	90S	689	GLY
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 31

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	710	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	695	VON
2	EA	PANIC HARDWARE	LD-99-EO	626	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	613	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	613	SCH
2	EA	FLUSH PULL	BY DOOR MANUFACTURER		B/O
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
2	EA	MOUNTING PLATE	4040XP-18PA	695	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	695	LCN
2	EA	BLADE STOP SPACER	4040XP-61	695	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP, BRUSH W/ DRIP	8198D	D	ZER
1	EA	THRESHOLD, 1/2"	655D	D	ZER
2	EA	DOOR CONTACT	BY DIV 28		B/O

Hardware Group No. 32

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL OFFICE LOCK	ND91BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 33

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 34

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	OH STOP & HOLDER	90H	689	GLY
1	EA	SURFACE CLOSER	4040XP REG TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 35

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL OFFICE LOCK	ND91BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP REG TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 36

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL STOREROOM LOCK	ND96BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER (W/ DEAD STOP)	4040XP CUSH TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 37

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL OFFICE LOCK	ND91BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP REG TBMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 38

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP REG TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 39

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL OFFICE LOCK	ND91BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	OH STOP	90S	689	GLY
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 40

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	710	IVE
1	EA	CONT. HINGE	112XY EPT	710	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	695	VON
1	EA	PANIC HARDWARE	LD-99-EO	313	VON
1	EA	ELEC PANIC HARDWARE	LX-QEL-99-NL-OP-110MD 24 VDC	313	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	613	SCH
1	EA	RIM CYL HOUSING (SFIC)	80-159 (W/ KEYED CONST CORE)	613	SCH
2	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	613	SCH
2	EA	FLUSH PULL	BY DOOR MANUFACTURER		B/O
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC	695	LCN
1	EA	MOUNTING PLATE	4040XP-18PA	695	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	695	LCN
1	EA	BLADE STOP SPACER	4040XP-61	695	LCN
2	EA	ACTUATOR	8310-853T	630	LCN
2	EA	MOUNT BOX	8310-867S		LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
2	EA	DOOR CONTACT	BY DIV 28		B/O
1	EA	POWER SUPPLY	PS914 900-4R 120/240 VAC		VON

DOOR(S) NORMALLY CLOSED AND LOCKED AND EXTERIOR ACTUATOR DISABLED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH AND ENABLES EXTERIOR ACTUATOR. PUSHING ENABLED EXTERIOR ACTUATOR SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. INTERIOR ACTUATOR ENABLED AT ALL TIMES. PUSHING INTERIOR ACTUATOR RETRACTS LATCH AND SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. EXIT DEVICE LATCH ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 41

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	224XY	628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB	689	VON
2	EA	PANIC HARDWARE	LD-99-L-2-06	626	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	626	SCH
2	EA	RIM CYL HOUSING (SFIC)	80-116 (W/ DISP CONST CORE)	626	SCH
2	EA	TTURN RIM CYLINDER	XB13-379	626	SCH
3	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
1	EA	SURFACE CLOSER (W/ DEAD STOP & HO)	4040XP HCUSH TBWMS	689	LCN
1	EA	WALL STOP/HOLDER	WS40/WS40X	626	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 42

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY EPT	710	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	LX-QEL-99-NL 24 VDC	313	VON
1	EA	RIM CYL HOUSING (SFIC)	80-116 (W/ DISP CONST CORE)	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	FLUSH PULL	BY DOOR MANUFACTURER		B/O
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
1	EA	RAIN DRIP	142D (IF EXPOSED ABOVE)	D	ZER
1	SET	GASKETING	328AA-S JAMB SEAL	D	ZER
1	EA	GASKETING	429AA -HEAD SEAL	D	ZER
1	EA	DOOR SWEEP, BRUSH W/ DRIP	8198D	D	ZER
1	EA	THRESHOLD, 1/2"	655D	D	ZER
1	EA	DOOR CONTACT	BY DIV 28		B/O
1	EA	CREDENTIAL READER	BY ACCESS CONTROL INTEGRATOR		B/O
1	EA	POWER SUPPLY	PS914 900-2RS 120/240 VAC		VON

DOOR(S) NORMALLY CLOSED AND LOCKED. PRESENTING VALID CREDENTIAL TO READER RETRACTS EXIT DEVICE LATCH, ALLOWING ACCESS. EXIT DEVICE LATCH ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 43

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	112XY	710	IVE
1	EA	FIRE RATED REMOVABLE MULLION	KR9954	689	VON
2	EA	PANIC HARDWARE	LD-99-L-2-06	626	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	626	SCH
2	EA	RIM CYL HOUSING (SFIC)	80-116 (W/ DISP CONST CORE)	626	SCH
2	EA	TTURN RIM CYLINDER	XB13-379	626	SCH
3	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
2	EA	MOUNTING PLATE	4040XP-18PA	695	LCN
2	EA	CUSH SHOE SUPPORT	4040XP-30	695	LCN
2	EA	BLADE STOP SPACER	4040XP-61	695	LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O

Hardware Group No. 44

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL OFFICE LOCK	ND91BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 45

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	VANDL STOREROOM LOCK	ND96BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
2	EA	OH STOP	90S	689	GLY
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 46

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	VANDL OFFICE LOCK	ND91BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP REG TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 47

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	710	IVE
1	EA	CONT. HINGE	112XY EPT	710	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	REMOVABLE MULLION	KR4954 STAB	695	VON
1	EA	PANIC HARDWARE	LD-99-EO	313	VON
1	EA	ELEC PANIC HARDWARE	LX-QEL-99-NL-OP-110MD 24 VDC	313	VON
1	EA	MORTISE CYL HOUSING (SFIC)	80-110 (W/ DISP CONST CORE)	613	SCH
1	EA	RIM CYL HOUSING (SFIC)	80-159 (W/ KEYED CONST CORE)	613	SCH
2	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	613	SCH
2	EA	FLUSH PULL	BY DOOR MANUFACTURER		B/O
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC	695	LCN
1	EA	MOUNTING PLATE	4040XP-18PA	695	LCN
1	EA	CUSH SHOE SUPPORT	4040XP-30	695	LCN
1	EA	BLADE STOP SPACER	4040XP-61	695	LCN
2	EA	ACTUATOR	8310-853T	630	LCN
2	EA	MOUNT BOX	8310-867S		LCN
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	WEATHERSTRIPPING	BY DOOR/FRAME MANUFACTURER		B/O
2	EA	DOOR CONTACT	BY DIV 28		B/O
1	EA	DESK MOUNT BUTTON	660-PB	628	SCE
1	EA	POWER SUPPLY	PS914 900-4R 120/240 VAC		VON

DOOR(S) NORMALLY CLOSED AND LOCKED AND EXTERIOR ACTUATOR DISABLED. PRESENTING VALID CREDENTIAL TO READER RETRACTS OR PUSH BUTTON AT RECEPTION DESK, MOMENTARILY RELEASES EXIT DEVICE LATCH AND ENABLES EXTERIOR ACTUATOR. PUSHING ENABLED EXTERIOR ACTUATOR SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. INTERIOR ACTUATOR ENABLED AT ALL TIMES. PUSHING INTERIOR ACTUATOR RETRACTS LATCH AND SIGNALS AUTOMATIC OPERATOR TO OPEN DOOR. EXIT DEVICE LATCH ALSO CAPABLE OF BEING ELECTRONICALLY DOGGED DOWN (I.E. PUSH/PULL MODE) AS DESIGNATED BY ACCESS CONTROL SYSTEM SCHEDULE. EXIT DEVICE LATCHES AND LOCKS WITH LOSS OF POWER. FREE EGRESS AT ALL TIMES.

Hardware Group No. 48

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 SIZE, QTY, NRP AS REQ'D (SEE SPECS)	652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50BDC RHO	626	SCH
1	EA	PERMANENT CORE (SFIC EVEREST)	80-037 EV29 R	626	SCH
1	EA	SURFACE CLOSER	4040XP EDA TBWMS	689	LCN
1	EA	KICK PLATE	8400 10" X 1 1/2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

END OF SECTION 087100

Door#	HwSet#
100A	31
100B	18
100C	17
100D	47
102	41
103	28
104	32
105A1	42
105A2	23
105A3	23
105C1	45
105C2	45
106	02
107A	42
107B	29
108A	30
108B	33
109A	03
109B	04
110	07
111	04
112	13
112A	26
113	02
114A	34
114B	35
114C	35
115A	31
115B	18
115C	17
115D	40
116A	43
116B	43
116C	19
118	14
119	45
120	12
121	08
123	09
123A	19
123B	01
124A	27
124B	27
125	32
126	32
127	32

Door#	HwSet#
128	32
129	25
130	36
131	36
132	12
133	37
134	14
136A	11
136B	11
137A	11
137B	11
138	11
139	11
140	11
141	19
142	11
143	11
144	11
145	11
146A	11
147	07
148	11
149	09
150	11
151	11
152A	15
152B	15
153	11
154	22
156	05
157	04
158A	38
158B	03
159	04
160	04
161	46
162A	32
162B	04
163	07
164	07
165A	39
165B	03
166	24
167A	10
167B	48
202A	22

Door#	HwSet#
202B	16
205A	27
205B	27
206	32
207	32
208	32
209	32
211	21
212	21
213	12
214	32
215	44
216	14
218A	11
218B	11
219A	11
219B	11
220	11
221	11
222	11
224	11
225	11
226	11
227	11
228	11
229	11
230A	06
231	09
232	07
233	07
234	07
235A	15
235B	15
236	09
237	09
238	04
239A	20
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SECTION 096519
RESILIENT TILE FLOORING (Revised Addendum #2)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile, Luxury Vinyl Tile Flooring.
2. Homogenous Vinyl Plank Vinyl Tile Flooring with laser cut court lines.
3. Vinyl composition floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.
3. Locate all transitions between different flooring types.

C. Samples for Initial Selection: For each type of floor tile indicated.

D. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

E. Welded-Seam Samples: For seamless-installation technique indicated and for each floor covering product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

F. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish equal to four percent (4%) full-sized materials thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Coordinate mockups in this Section with mockups specified in other Sections.

a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Owner/Architect.

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 60 deg F or more than 95 deg F and no more than 75% humidity, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 SOLID VINYL FLOOR TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Tarkett as indicated on Finish Key in drawings or comparable product by one of the following:

1. Interface
2. Novo

B. Tile Standard: ASTM F1700.

1. Class: Surface-Decorated Vinyl Tile Class III, Printed Film Vinyl Tile.
2. Type: B, Embossed Surface.

C. Thickness: 3.0 mm (.120 inches).

D. Wear Layer Thickness: 30mil (.76mm)

E. Finish: Techtonic.

F. Size: May vary by style/color. Reference Finish Key Specification on Drawing for sizes by style.

G. Seamless-Installation Method: As indicated on the drawing Finish Key and Finish Plans.

H. Colors and Patterns: Reference Drawing set for Finish Key Basis of Design and Finish Plans for finish schedule tags. Colors to be selected from manufacturer's full range of colors within the style designation.

2.2 RESILIENT FLOORING- ATHLETIC USE

A. Homogeneous polyumeric calendared layers with PVC wear layer. Techtonic polyurethane coating technology that is durable and resists scratching, abrasions, scuffing and staining.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following

a. Tarkett-Latitude; a Tarkett company
b. Nora by Interface
c. Substitutions: See Section 016000 - Product Requirements.

2. Material: Meets ASTM F1700, Class III, Type B, performance standards for solid vinyl floor tile.
3. Traffic-Surface Texture: Smooth.
4. Plank Size: 6 inch x 48 inches
5. Wear Thickness: 20 mil
6. Color and Pattern of field and Borders: As selected by Architect from manufacturer's full range in the styles and patterns designated on the Finish Key Legend on the drawings.
7. Court Lines: Interlayed custom cut court lines created in patterns directed on Floor plans. Colors to be selected in up to 5 colors from Tarkett, Victory Chroma Collection of colors.

2.3 VINYL COMPOSITION FLOOR TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Flooring, Inc.; Premium Excelon or comparable product by one of the following:

1. American Biltrite
2. Armstrong Flooring

3. Johnsonite; a Tarkett company
4. Substitutions: See Section 016000 - Product Requirements.

B. Tile Standard: ASTM F1066, ASTM F1066, Class 2, through pattern.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns: To be selected from the manufacturer’s full color range.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
    a. Colors: As selected by Architect from manufacturer's full range to contrast with floor tile.
2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

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

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor

tile manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 70 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated on drawings or on Finish Key.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay VCT tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
2. Lay LVT tiles in direction with Finish Key Legend and as directed on Finish Plan Drawings.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a

completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

H. Seamless Installation:

1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

I. Resilient Terrazzo Accessories: Install according to manufacturer's written instructions.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish to VCT flooring only. LVT does NOT require floor polish, follow recommended flooring manufacturer written instructions for final finish on LVT.

1. Apply two coat(s).

E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 123213
MANUFACTURED WOOD-VENEER-FACED CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood-veneer-faced casework.
2. Hardware and accessories.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
3. Section 096513 "Resilient Base and Accessories" for resilient base applied to wood-veneer-faced casework.
4. Section 123623.13 "PLASTIC-LAMINATE-CLAD COUNTERTOPS" for countertops installed on base cabinets.
5. Section 123661.16 "SOLID SURFACING COUNTERTOPS" for countertops with sinks installed on base cabinets.

1.2 DEFINITIONS

A. Definitions in the AWI/AWMAC/WI's "Architectural Woodwork Standards" apply to the Work of this Section.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Wood-veneer-faced casework.
2. Hardware and accessories.

B. Shop Drawings: For wood-veneer-faced casework.

1. Include plans, elevations, sections, and attachments to other work including blocking and reinforcements required for installation.
2. Indicate types and sizes of casework.
3. Indicate manufacturer's catalog numbers for casework.
4. Show fabrication details, including types and locations of hardware.
5. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.

C. Keying Schedule: Include schematic keying diagram, and index each key set to unique

designations that are coordinated with the Contract Documents.

D. Samples: For casework and hardware finishes.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish complete touchup kit for each casework finish provided. Include fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during remainder of construction period. Maintain temperature and relative humidity during remainder of construction period in range recommended for Project location by the AWI/AWMAC/WI's "Architectural Woodwork Standards."

B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of components or other failures of glue bond.
b. Warping of components.
c. Failure of operating hardware.
d. Deterioration of finishes.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CASEWORK

A. Quality Standard: Unless otherwise indicated, comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.

1. Grade: Premium.

B. Product Designations:

1. Drawings indicate sizes, configurations, and finish materials of manufactured wood-veneer-faced casework.

2.2 WOOD-VENEER-FACED CASEWORK

A. Source Limitations: Obtain from single source from single manufacturer.

B. Design: Frameless cabinet construction with the following door and drawer-front style:

1. Flush overlay.

C. Wood Species: Red oak.

1. Wood Stain Colors and Finishes: As selected by Architect from casework manufacturer's full range.

D. Face Veneer Cut: Plain sliced.

E. Veneer Matching:

1. Provide veneers for each elevation from a single flitch, book or slip and balance matched.

F. Grain Direction:

1. Doors: Vertical with continuous vertical matching.
2. Drawer Fronts: Vertical with continuous vertical matching.
3. Face Frame Members: Lengthwise.
4. End Panels: Vertical.
5. Bottoms and Tops of Units: Side to side.
6. Knee Space Panels: Vertical.
7. Aprons: Horizontal.

G. Exposed Materials:

1. Plywood: Hardwood plywood with face veneer of species indicated, selected for compatible color and grain. Provide backs of same species as faces.
2. Solid Wood: Clear hardwood lumber of species indicated and selected for grain and color compatible with exposed plywood.
3. Edgebanding: Solid wood, minimum 1/8 inch thick and of same species as face veneer.

H. Semiexposed Materials:

1. Wood: Provide solid wood or hardwood plywood for semiexposed surfaces unless otherwise indicated.

a. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of species similar in color and grain to exposed wood.
b. Plywood: Hardwood plywood of species similar in color and grain to exposed wood. Provide backs of same species as faces.

2. Thermally Fused Laminate (TFL) Panels: Provide thermally fused laminate panels for semiexposed surfaces, except provide solid wood or hardwood plywood for interior faces of doors and drawer fronts and other locations where opposite side of component is exposed.
   a. Colors and Patterns: As selected by Architect from manufacturer's full range.
3. Hardboard: Use only for cabinet backs where exterior side of back is not exposed.

I. Concealed Materials:

1. Solid Wood: With no defects affecting strength or utility.
2. Plywood: Hardwood plywood. Provide backs of same species as faces.
3. Particleboard.
4. MDF.
5. Hardboard.

2.3 HARDWARE AND ACCESSORIES

A. Hardware: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.

1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.

B. Butt Hinges: Stainless steel, semiconcealed, five-knuckle hinges complying with ANSI/BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two hinges for doors less than 48 inches high, and provide three hinges for doors more than 48 inches high.

C. Pulls: Ribbon Handles: Solid aluminum, fastened from back with two screws.

1. provide two pulls for drawers more than 24 inches wide.

D. Door Catches: Zinc-plated, dual, self-aligning, permanent magnet catch. Provide two catches on doors more than 48 inches high.

E. Door and Drawer Bumpers: Self-adhering, clear silicone rubber.

1. Doors: Provide one bumper at top and bottom of closing edge of each swinging door.
2. Drawers: Provide one bumper on back side of drawer front at each corner.

F. Drawer Slides: ANSI/BHMA A156.9.

1. Heavy Duty (Grade 1HD-100): Side mount.
   a. Type: Full overtravel extension.
   b. Material: Zinc-plated ball bearing slides.
   c. Motion Feature: Self-closing mechanism.
2. General-purpose drawers; provide 100 lb load capacity.
3. File drawers; provide 150 lb load capacity.

G. Drawer and Hinged-Door Locks: Cylindrical (cam) type, five-pin tumbler, brass with chrome-plated finish, and complying with ANSI/BHMA A156.11, Grade 1.

1. Provide a minimum of two keys per lock and six master keys.
2. Provide locks where indicated.
    a. Master key for up to 500 key changes.

H. Adjustable Shelf Supports:

1. Pin-type, single-pin metal shelf rests complying with ANSI/BHMA A156.9, Type B04013.

2.4 MATERIALS

A. Composite Wood Products: Products shall be made without urea formaldehyde.

B. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

C. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.

D. Softwood Plywood: DOC PS 1.

E. Particleboard: ANSI A208.1, Grade M-2.

F. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130.

G. Hardboard: ANSI A135.4, Class 1 tempered.

H. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

A. Wood-Veneer-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:

1. Bottoms of Cabinets and Tops of Wall Cabinets: 3/4-inch- thick, veneer-corehardwood plywood.
2. Ends of Cabinets: 3/4-inch- thick, hardwood plywood.
3. Shelves: 3/4-inch- thick, veneer-core hardwood plywood or 1-inch- thick, particleboard-core hardwood plywood.
4. Base Cabinet Top Frames: 3/4-by-2-inch solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
5. Base Cabinet Stretchers: 3/4-by-4-1/2-inch plywood, particleboard, or MDF strips or solid-wood boards at front and back of cabinet, glued and pinned or screwed. May be provided as an option to base cabinet top frames.
6. Base Cabinet Subtops: 3/4-inch- thick panel product, glued and pinned or screwed. May be provided as an option to base cabinet top frames.
7. Backs of Cabinets: 3/4-inch- thick, particleboard-core hardwood plywood where exposed, 1/4-inch- thick, veneer-core hardwood plywood, dadoed into sides, bottoms, and tops where not exposed.
8. Drawer Fronts: 3/4-inch- thick, particleboard-core hardwood plywood or solid hardwood.
9. Drawer Sides and Backs: 1/2-inch- thick, solid-wood or veneer-core hardwood plywood, with glued dovetail or multiple-dowel joints.

10. Drawer Bottoms: 1/4-inch- thick, veneer-core hardwood plywood, glued and dadoed into front, back, and sides of drawers. Use 1/2-inch- thick material for drawers more than 24 inches wide.
11. Cabinet Doors:
    a. 48 Inches (1220 mm) or Less in Height: 3/4 inch thick, with solid hardwood stiles and rails, particleboard or MDF cores, and hardwood face veneers and crossbands.
    b. 48 Inches (1220 mm) or More in Height: 1-1/16 inches thick, with solid hardwood stiles and rails, honeycomb cores, and hardwood face veneers and crossbands.

B. Filler Strips: Provide as needed to close spaces between casework and walls, ceilings, and equipment. Fabricate from same material and with same finish as casework.

2.6 FINISH

A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors and drawer fronts and molded shapes with profile-edge sander. Sand casework after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

B. Staining: Remove fibers and dust and apply wash-coat sealer and stain to exposed and semiexposed surfaces as required to provide uniform color and to match approved Samples.

C. Finishing Open-Grain Woods: Apply manufacturer's standard three-coat, baked, clear finish consisting of a thermosetting catalyzed sealer and two coats of a thermosetting catalyzed conversion varnish. Sand and wipe clean between applications of sealer and topcoat and between topcoats. Topcoats may be omitted on concealed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION

A. Grade: Install casework to comply with same quality standard grade as item to be installed.

B. Install casework level, plumb, and true in line; shim as required using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch. Bolt adjacent cabinets together with joints flush, tight, and uniform.

D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten cabinets to hanging strips, masonry, framing, wood blocking, or

reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

E. Fasten casework to adjacent units and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI/AWMAC/WI's "Architectural Woodwork Standards."

F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

G. Adjust operating hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 CLEANING

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 123213

SECTION 221313
FACILITY SANITARY SEWERS (SITE)

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. Pipe and fittings.
2. Nonpressure and pressure couplings.
3. Cleanouts.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

1.4 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. PVC Profile Sewer Piping:

1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

B. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

C. PVC Gravity Sewer Piping:

1. Pipe and Fittings: ASTM F 679, T-1 wall thickness, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.

2.2 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

C. Unshielded, Flexible Couplings:

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

a. Dallas Specialty & Mfg. Co.
b. Fernco Inc.
c. Logan Clay Pipe.
d. Mission Rubber Company; a division of MCP Industries, Inc.
e. NDS.
f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

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

a. Cascade Waterworks Mfg.
b. Dallas Specialty & Mfg. Co.
c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

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

    a. Fernco Inc.
    b. Logan Clay Pipe.
    c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

F. Nonpressure-Type, Rigid Couplings:

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

    a. ANACO-Husky.

2. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling, molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:

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

    a. Josam Company.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.
    d. Tyler Pipe.
    e. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Top-Loading Classification(s): Heavy Duty .
4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.4 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: 1 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent unless otherwise indicated.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
3. Install piping with 36-inch minimum cover.
4. Install PVC profile sewer piping according to ASTM D 2321 and ASTM F 1668.
5. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.
6. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join PVC profile sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
2. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
3. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

a. Shielded flexible or rigid couplings for pipes of same or slightly different OD.
b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.
c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure pipe couplings for force-main joints.

3.4 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.5 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.6 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

B. Connect force-main piping to building's sanitary force mains specified in Section 22 13 16 "Sanitary Waste and Vent Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Connect to grease interceptors specified in Section 22 13 23 "Sanitary Waste Interceptors."

3.7 IDENTIFICATION

A. Comply with requirements in Section 312000 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

END OF SECTION 221313

SECTION 232123
HYDRONIC PUMPS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Close-coupled, in-line centrifugal pumps.
2. Close-coupled, end-suction centrifugal pumps.
3. Separately coupled, in-line centrifugal pumps.
4. Separately coupled, base-mounted, end-suction centrifugal pumps.
5. Separately coupled, base-mounted, double-suction centrifugal pumps.
6. Separately coupled, turbine centrifugal pumps.
7. Automatic condensate pump units.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of pump.

B. Shop Drawings: For each pump.
1. Show pump layout and connections.
2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
3. Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 PRODUCTS

2.1 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong.
2. Bell & Gossett.
3. Taco.
4. Grundfos.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically. Pump shall be rated for minimum of 175 psig and 250 deg F unless indicated otherwise.

C. Pump Construction:
1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet and threaded companion-flange connections.

2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
3. Pump Shaft: Stainless steel.
4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPDM/EPT/EPR elastomer bellows and carbon-ceramic faces. Include water slinger on shaft between motor and seal.
5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.

D. Motor: Single speed and rigidly mounted to pump casing.
1. Single speed with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing.
2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 CLOSE-COUPLED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong.
2. Bell & Gossett.
3. Grundfos.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally. Pump shall be rated for minimum of 175 psig and 250 deg F unless indicated otherwise.

C. Pump Construction:
1. Casing: Radially split, cast iron, with drain plug at bottom and air vent at top of volute, threaded gage tappings at inlet and outlet, and threaded companion-flange connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
3. Pump Shaft: Stainless steel.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPDM/EPT/EPR elastomer bellows and gasket. Include water slinger on shaft between motor and seal.

D. Motor: Single speed and rigidly mounted to pump casing with integral pump support.
1. Single speed with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.3 SEPARATELY COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong.
   2. Bell & Gossett.
   3. Grundfos.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted vertically. Pump shall be rated for minimum of 175 psig and 250 deg F unless indicated otherwise.

C. Pump Construction:
   1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet and threaded companion-flange connections.
   2. Impeller: ASTM B 584, cast bronze or stainless steel; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
   3. Pump Shaft: Stainless steel.
   4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPDM/EPT/EPR elastomer bellows and gasket. Include water slinger on shaft between motor and seal.
   5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.

D. Shaft Coupling: high tensile axially split aluminum bar capable of absorbing vibration.

E. Motor: Single speed and rigidly mounted to pump casing with lifting eyebolt and supporting lugs in motor enclosure.
   1. Single speed with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing.
   2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   3. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.4 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong.
   2. Bell & Gossett.
   3. Grundfos.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal. Pump shall be rated for minimum of 175 psig and 250 deg F unless indicated otherwise.

C. Pump Construction:
1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. Provide integral mount on volute to support the casing, and provide attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.
2. Impeller: ASTM B 584, cast bronze or stainless steel; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Stainless steel.
4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPDM/EPT/EPR elastomer bellows and gasket.
5. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
6. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings.

D. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. EPDM coupling sleeve for variable-speed applications.

E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

G. Motor: Single speed, secured to mounting frame, with adjustable alignment.
1. Single speed with grease lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Shall be regreaseable without removal of bearings from assembly.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.5 SEPARATELY COUPLED, BASE-MOUNTED, DOUBLE-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong.
2. Bell & Gossett.

3. Grundfos.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal. Pump shall be rated for minimum of 175 psig and 250 deg F unless indicated otherwise.

C. Pump Construction:
1. Casing: Horizontally split, cast iron, with threaded gauge tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and ASME B16.1, Class 125 flanges. Casing supports shall allow removal and replacement of impeller without disconnecting piping.
2. Impeller: ASTM B584, cast bronze; statically and dynamically balanced, and keyed to shaft. For pumps that are not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Stainless steel.
4. Seal, Mechanical Type: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless steel spring, and EPDM/EPT/EPR elastomer bellows and gasket.
5. Seal, Packing Type: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
6. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings.

D. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. EPDM coupling sleeve for variable-speed applications.

E. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.

F. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36/A 36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

G. Motor: Single speed, secured to mounting frame, with adjustable alignment.
1. Single speed with grease lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Shall be regreaseable without removal of bearings from assembly.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.6 SEPARATELY COUPLED, TURBINE CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Bell & Gossett.

2. Grundfos.
3. Taco.

B. Description: Factory-assembled and -tested, centrifugal, impeller-between-bearings, end-suction pump as defined in HI 2.1-2.2 and HI 2.3; designed for installation with pump and motor shafts mounted vertically and projecting into a sump. Pump shall be rated for minimum of 175 psig and 250 deg F unless indicated otherwise.

C. Pump Construction:
1. Pump Bowl: Cast iron, with **cone** or **basket** strainer**,** replaceable bronze wear ring, and suction bell.
2. Impeller: ASTM B584, cast bronze; statically and dynamically balanced and keyed to shaft. For pumps that are not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Stainless steel sized in accordance with manufacturer's written instructions.
4. Pump Bearings: Water-lubricated bronze and rubber sleeve bearings in cast-iron housing.
5. Pump Column: ASTM A53/A53M, Grade B steel pipe.
6. Seal, Mechanical Type: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless steel spring, and EPDM bellows and gasket. Include water slinger on shaft between motor and seal.
7. Seal, Packing Type: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.

D. Shaft Coupling: Keyed with locking collets.

E. Discharge Head: ASME B16.1, Class 125 discharge flange with threaded gauge tapping. Top of discharge head shall have a registered fit to accurately locate the driver.

A. Motor: Single speed, secured to mounting frame, with adjustable alignment.
1. Single speed with grease lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Shall be regreaseable without removal of bearings from assembly.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment" for totally enclose fan cooled.

2.7 AUTOMATIC CONDENSATE PUMP UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Aurora (Pentair).
2. Beckett Corporation.
3. Flowserve Corporation.
4. Hartell.
5. Little Giant Pump Co.

B. Description: Packaged units with corrosion-resistant pump, plastic tank with cover, and automatic controls. Include factory- or field-installed check valve and a 72-inch-minimum, electrical power cord with plug.

2.8 PUMP SPECIALTY FITTINGS

A. Suction Diffuser:
1. Angle pattern.
2. 175-psig pressure rating, cast-iron body and end cap, pump-inlet fitting.
3. Bronze startup and bronze or stainless-steel permanent strainers.
4. Bronze or stainless-steel straightening vanes.
5. Drain plug.
6. Factory-fabricated support.

B. Triple-Duty Valve:
1. Angle or straight pattern.
2. 175-psig pressure rating, cast iron body, pump-discharge fitting.
3. Drain plug and bronze-fitted shutoff, balancing, and check valve features.
4. Brass gage ports with integral check valve and orifice for flow measurement.

PART 3 EXECUTION

3.1 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

E. Equipment Mounting:
1. Install base-mounted pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Division 3.
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
3. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

F. Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and spring hangers of size required to support weight of in-line pumps.
1. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

3.2 ALIGNMENT

A. Engage a factory-authorized service representative to perform alignment service per manufacturers written instructions.

B. Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.

C. Comply with pump and coupling manufacturers' written instructions.

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 232213 "Steam and Condensate Heating Piping" and Section 232216 "Steam and Condensate Heating Piping Specialties."

B. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Where installing piping adjacent to pump, allow space for service and maintenance.

D. Connect piping to pumps. Install isolation/shutoff valves, check valves, and flexible connectors that are same size as piping connected to pumps.

E. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

F. Install suction diffuser with integral strainer, calibrated metering station and shutoff valve on suction side of base mounted pumps.

G. Install triple duty valve on discharge side of base mounted pumps. Install additional shutoff valve directly downstream of triple duty valve.

H. Install non-slam check valve and shutoff valve on discharge of base mounted pumps which are powered by a variable frequency controller.

I. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

J. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.

K. Install check valve and gate or ball valve on each condensate pump unit discharge.

L. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

M. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION 232123

SECTION 260533
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal conduits and fittings.
   2. Nonmetallic conduits and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Surface raceways.
   5. Boxes, enclosures, and cabinets.
   6. Handholes and boxes for exterior underground cabling.

B. Related Requirements:
   1. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

PART 2 PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit; a part of Atkore International.
      b. Anamet Electrical, Inc.
      c. FSR Inc.
      d. NEC, Inc.
      e. O-Z/Gedney; a brand of Emerson Industrial Automation.

f. Southwire Company.
g. Thomas & Betts Corporation; A Member of the ABB Group.

2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. IMC: Comply with ANSI C80.6 and UL 1242.
5. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
   a. Comply with NEMA RN 1.
   b. Coating Thickness: 0.040 inch, minimum.
6. EMT: Comply with ANSI C80.3 and UL 797.
7. FMC: Comply with UL 1; aluminum.
8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Allied Tube & Conduit; a part of Atkore International.
   b. FSR Inc.
   c. NEC, Inc.
   d. O-Z/Gedney; a brand of Emerson Industrial Automation.
   e. Southwire Company.
   f. Thomas & Betts Corporation; A Member of the ABB Group.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Fittings for EMT:
   a. Material: Steel or die cast.
   b. Type: Setscrew.
5. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
6. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. B-line, an Eaton business.
2. Hoffman; a brand of nVent.
3. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. FSR Inc.
2. Hoffman; a brand of nVent.
3. Hubbell Incorporated; Wiring Device-Kellems.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. Thomas & Betts Corporation; A Member of the ABB Group.
6. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:
1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, round.
1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

M. Gangable boxes are allowed.

N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

O. Cabinets:
1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Anamet Electrical, Inc.
b. Arnco Corporation.
c. Champion Fiberglass, Inc.
d. RACO; Hubbell.
e. Thomas & Betts Corporation; A Member of the ABB Group.

B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
1. ENT: Comply with NEMA TC 13 and UL 1653.
2. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3. LFNC: Comply with UL 1660.

C. Nonmetallic Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Anamet Electrical, Inc.
b. Condux International, Inc.
c. RACO; Hubbell.
d. Thomas & Betts Corporation; A Member of the ABB Group.
2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
4. Fittings for LFNC: Comply with UL 514B.
5. Solvents and Adhesives: As recommended by conduit manufacturer.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:
1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Armorcast Products Company.
b. Quazite: Hubbell Power Systems, Inc.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Armorcast Products Company.
b. Quazite: Hubbell Power Systems, Inc.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC.".
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: LFMC.
3. Underground Conduit: RNC, Type EPC-40-PVC.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.
1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
   a. Mechanical rooms.
   b. Electrical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: FMC is allowed. MC cable is preferred. All communication systems to be installed in EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: LFMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Support conduit within 12 inches of enclosures to which attached.

H. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
   4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
   5. Change from ENT to GRC before rising above floor.

I. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

O. Surface Raceways:
   1. Install surface raceway with a minimum 2-inchradius control at bend points.
   2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

R. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
   d. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.

U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

W. Locate boxes so that cover or plate will not span different building finishes.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Z. Set metal floor boxes level and flush with finished floor surface.

AA. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line, 36-inches below grade.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 311000
SITE CLEARING

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 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

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

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

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

1.3 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Impoundment of water.
5. Excavation or other digging unless otherwise indicated.
6. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

C. Do not direct vehicle or equipment exhaust towards protection zones.

D. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Wrap a 1-inch blue vinyl tie tape flag around each tree trunk at 54 inches above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

B. Locate, identify, and disconnect utilities indicated to be abandoned in place.

C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Grind down stumps and remove roots, obstructions, and debris to a depth of 24 inches below exposed subgrade.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

B. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000
EARTH MOVING

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. Preparing subgrades for walks pavements turf and grasses and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:

1. for excavating well hole to accommodate elevator-cylinder assembly.
2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping topsoil, and removal of above- and below-grade improvements and utilities.
3. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
4. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom; measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

1.5 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 311000 "Site Clearing," are in place.

E. Do not commence earth moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:

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

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

C. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

D. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

G. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

H. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

I. Sand: ASTM C 33; fine aggregate.

J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.

3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.

5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.

C. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course.

3.11 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.15 SUBSURFACE DRAINAGE

A. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698.

2. Place and compact impervious fill over drainage backfill in 6-inch- thick compacted layers to final subgrade.

3.16 CUT AND FILL CALCULATIONS - CONTRACTOR'S RESPONSIBILITY

A. It is the Contractor's responsibility to fully calculate all earthwork to determine requirements for earthwork construction prior to Bid submission in accordance with the Contract Documents. There will be no change orders issued for hauling soil offsite or onto the site as necessary to meet the final grades and the requirements of the Project Master Schedule.

1. If there is an excess of soil after Construction is complete, the Contractor shall include in their Bid the costs to haul all excess soil off the Owner's property at no additional costs to the Owner. Excess soil from all sources, such as, but not limited to, foundation excavation, utility trenches, etc., shall be included in the calculations.
2. If additional soil is needed to meet indicated grade elevations, the Contractor shall include in their Bid all costs associated with buying and hauling the extra soil needed to the site at no additional costs to the Owner.
3. Temporary stockpile locations are indicated on the Drawings, however, these are only available during Construction and all excess soil, including topsoil, if applicable, shall be removed.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Place base course material over subbase course under hot-mix asphalt pavement.
2. Shape subbase course and base course to required crown elevations and cross-slope grades.
3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
4. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course 6 inches or less in compacted thickness in a single layer.
2. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

3. Compact each layer of drainage course to required cross sections and thicknesses to not less than **95** percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
4. Insert special inspections.

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

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION 312000

SECTION 321216
ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Cold milling of existing hot-mix asphalt pavement.
2. Hot-mix asphalt patching.
3. Hot-mix asphalt paving.
4. Hot-mix asphalt paving overlay.
5. Asphalt surface treatments.
6. Pavement-marking paint.

B. Related Sections:

1. Division 32 Sections for other paving installed as part of crosswalks in asphalt pavement areas.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located INDOT.

B. Installer Qualifications: Imprinted-asphalt manufacturer's authorized installer who is trained and approved for installation of imprinted asphalt required for this Project.

C. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

D. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of INDOT for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22 .

B. Asphalt Cement: ASTM D 3381 for viscosity-graded material.

C. Prime Coat: Asphalt emulsion prime coat complying with INDOT requirements.

D. Tack Coat: emulsified asphalt, or cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Water: Potable.

F. Undersealing Asphalt: ASTM D 3141, pumping consistency.

2.3 AUXILIARY MATERIALS

A. Sand: ASTM D 1073, Grade Nos. 2 or 3.

B. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952.

C. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.

2.4 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: 1 inch.
3. Surface Course: 1/2 inch.

B. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Provide mixes complying with composition, grading, and tolerance requirements in ASTM D 3515 for the following nominal, maximum aggregate sizes:

    a. Base Course: 1 inch.
    b. Surface Course: 1/2 inch.

C. Emulsified-Asphalt Slurry: ASTM D 3910, Type 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at minimum temperature of 250 deg F.
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.3 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints as shown on Drawings.
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.4 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch Insert size.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.6 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.7 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.8 FIELD QUALITY CONTROL

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

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.9 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow milled materials to accumulate on-site.

END OF SECTION 321216

SECTION 321313
CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Walkways.

B. Related Sections include the following:

1. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

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

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 CONCRETE MATERIALS

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

1. Portland Cement: ASTM C 150, Type I I/II, gray. Supplement with the following:

a. Fly Ash: ASTM C 618, Class C.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

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

D. Air-Entraining Admixture: ASTM C 260.

2.4 CURING MATERIALS

A. Water: Potable.

2.5 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4500 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 5 inches, plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 5-1/2 percent plus or minus 1.5 percent for 1-1/2-inch nominal maximum aggregate size.
2. Air Content: 6 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.
3. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

1. Fly Ash or Pozzolan: 25 percent.

2.6 SEALER

A. Excluding Unit Pavers, apply a heavy body sealer per manufacturer's requirements. The concrete sealer shall be an odor-free water-based, non-toxic, non-acid concrete cleaner and sealer.

1. Products:

a. Smith's Permanent Concrete Sealer.
b. Surface Koatings, Surface WB-75.
c. Specco, Waterstopper S-10.
d. CreteDegender.
e. Approved equal.

2.7 CONTROL JOINTS

Submit control joint location drawing prior to cutting and placing control joints for review and approval.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Do not add water to concrete during delivery or at Project site.

E. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.

1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer or use bonding agent if approved by Architect.

I. Screed pavement surfaces with a straightedge and strike off.

J. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

L. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

M. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

N. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

O. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

3.4 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373
CONCRETE PAVING JOINT SEALANTS

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. Cold-applied joint sealants.

B. Related Sections:

1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
2. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
3. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 QUALITY ASSURANCE

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

1.4 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.

1. Products: Subject to compliance with requirements, provide the following:

a. Crafco Inc., an ERGON company; RoadSaver Silicone.
b. Dow Corning Corporation; 888.
c. Pecora Corporation; 301 NS.

2.3 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.4 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place joint sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 329119
LANDSCAPE GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Proof rolling sub-grade.
2. Providing imported topsoil.
3. Providing structural CU soil.

1.3 RELATED SECTIONS

A. Refer to the following Specification Section for Related Work:

1. Section 015000 "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, and temporary security and protection facilities.
2. Section 017300 "Execution" for verifying utility locations and for recording field measurements.
3. Section 312000 "Earth Moving" for soil materials, excavating, backfilling, and site grading.
4. Section 328400 “Landscape Irrigation” for coordination with landscape irrigation systems.
5. Section 329219 “Seeding” for lawn seeding.
6. Section 329300 “Plants” for coordination with plant material installation.
7. Section 329443 “Tree Grates and Frames” for coordination with tree grate installation.
8. Section 334100 “Storm Utility Drainage Piping” for below-grade drainage of planted areas, paved areas, and wall perimeters.

1.4 REFERENCES

A. ASTM D2607 – Classification of peats, mosses, humus and related products.

B. ASTM D2976 – Standard pH test method of peat materials.

1.5 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Finish Grade: Elevation of finished surface of topsoil following natural settling, light rolling or light compaction activities.

C. Installer: The firm performing the installation of the topsoil.

D. Plant Pit Backfill: Soil mix specified for placement within the excavated holes for individual plant pits.

E. Planting Soil: Soil specified for planting beds and containers.

F. Structural Soil: Manufactured topsoil comprised of a structural crushed stone matrix and a plant sustaining soil capable of providing for the horticultural needs of plant material while ensuring suitable bearing capacity of pavements.

G. Sub-grade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing topsoil.

H. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

I. Substantial Completion: For the purposes of this and related Specification Sections and the scope(s) of work they cover, Substantial Completion refers to a stage in the installation of the project landscape or a portion thereof that is sufficiently complete, in accordance with the contract documents, so that the Owner may use or occupy the space or designated portion thereof for the intended purpose.

J. Spent Mushroom Substrate: Composted and pasteurized organic material remaining after a crop of mushrooms is harvested consisting of a mixture of natural products, including horse-bedded straw (straw from horse stables), hay, poultry manure, ground corn cobs, cottonseed hulls and gypsum and composted in piles or ricks, creating a superior, dark brown, fibrous, and pliable organic growing media.

K. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, weeds, roots, materials toxic to plants, other objects more than 1 inch in diameter or other non-soil materials.

1.6 SUBMITTALS

A. Qualification Data: For Installer, including:

1. Required qualifications of Installer.
2. Required qualifications of Installer’s project superintendent.

B. Submittals identified below will not be reviewed until the Installer’s Qualification Data is reviewed and approved by JQOL.

C. Imported Topsoil Analysis: Furnish Topsoil Quality Test according to requirements of ASTM F1632, F1647 Method A.

D. Spent Mushroom Substrate: Furnish:

1. Analysis indicating the Substrate’s suitability for plant growth, soluble salt content, % of organic matter, pH, C:N ratio, N:P:K levels.
2. Letter indicating the chain of custody of the Substrate confirming the age of the Substrate

and that it has been actively managed to encourage beneficial weathering.

E. Soils testing is to be performed by A&L Great Lakes Laboratories, 3505 Conestoga Drive, Fort Wayne, IN 46808, (206) 483-4759.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm qualified as a landscape installer with a minimum of five (5) years experience, of work of this type, scale and level of complexity, whose work has resulted in successful establishment of exterior plants.

B. The Installer shall have a member of the firm that holds the following credentials:

1. Hold a minimum of a four (4) year Bachelor's degree in the field of landscape contracting, landscape management, agronomy, landscape architecture or horticulture or be a Certified Landscape Professional by the Professional Landcare Network (PLANET). Non-horticultural degrees in related fields, such as construction management, do not qualify. The intent is to ensure a high level of knowledge and skill as it relates to the horticultural aspects of the project.
2. Have been an employee or owner of the Installer for a minimum of the immediately prior two (2) years.
3. Be available to respond to inquiries from Architect.

C. The Installer's project superintendent shall have the following credentials and be available to the project as follows:

1. Hold a minimum of two (2) year degree in the field of landscape contracting, landscape management, agronomy, or horticulture or be a Certified Landscape Technician – Exterior by the Professional Landcare Network (PLANET). Non-horticultural degrees in related fields, such as construction management, do not qualify. The intent is to ensure a high level of knowledge and skill as it relates to the horticultural aspects of the project.
2. Have been an employee or owner of the Installer for a minimum of the immediately prior two (2) years.
3. Be present on the project site a minimum of 100% of the time the Installer's crew is present on site.

D. Pre-installation Conference: Conduct conference at Project site; include at least items indicated in Part 3. This Conference will not be scheduled until the landscape contractor's "Installer Qualifications Data" submittal has been reviewed and approved by JQOL.

E. The work described within this Section as well as the Landscape Irrigation, Seeding, and Plants sections shall be contracted to a single landscape contractor.

1.8 SEQUENCING AND SCHEDULING

A. Place topsoil after utilities are complete and subgrade is established and acceptable.

PART 2 – PRODUCTS0

2.1 MATERIALS

A. All soils are to be free of materials or chemicals that are toxic to plant growth including desirable materials and chemicals that exist in such concentrations as to be toxic to plant growth.

B. Imported Topsoil: Dark loam, free of hard clods, stiff clay, stones, roots, sticks or other debris over one inch in size. Topsoil shall be free of toxic materials, tested for pH and adjusted to range between 6.0 and 7.5. Topsoil shall be tested for percentage of sand, silt, clay and organic matter and fall within the following ranges: sand, 25%-30%, silt, 28%-60%, clay, 8%-27%. Organic matter shall not be less than 3% nor greater than 5% as determined by loss on ignition of moisture-free samples dried at 65 degrees centigrade. Obtain imported topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

C. Structural Soil: Provide uniform blend of structural soil conforming to the requirements of CU Structural Soil as manufactured by a licensed supplier.

D. Spent Mushroom Compost: Well-composted, stable, and weed and pesticide-free organic matter, made from wheat straw, haw, corn cobs, cotton seed hulls, gypsum, sphagnum peat, ground limestone, and chicken manure and specifically formulated for the production of mushrooms. The compost is to resemble dark topsoil and have a loose, crumbly structure with a maximum particle of ½" and have an organic content between 40 and 60% as measured by loss on ignition. Nitrogen content to be 1.5 to 3% on a dry weight basis, phosphorus to be 0.5 to 2.0 % (reported as P2O5), potassium to be 1.0 to 3.0% (reported as K2O), calcium to be 3 to 6% and magnesium to be 0.4 to 1.0%. The pH is to be between 6.0 and 8.0 and free of substances toxic to plants. The composting process is to be actively managed with regular and repeated aerations over a period of three months. The NPK ratio is to be a minimum of 1:0.7:1.1 and C:N ratio is be less than 1:30.

1. Acceptable suppliers include Midwest Trading of Maple Park, IL and Greendell Landscape Solutions of Mooresville, IN. Submittals are still required from either vendor as required to confirm their product retains the specified characteristics.

E. Sand: Hard, granular, natural, uniformly graded sand, washed free of materials and chemicals deleterious to plant growth.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify site conditions are suitable for Work of this Section to begin.

B. Proof roll sub-grade.

C. Remove stones and debris larger than 3-inches in any dimension.

D. Beginning Work of this Section means acceptance of existing conditions and rough grading.

3.2 PROTECTION

A. Do not damage plant material and other features remaining as final work.

B. Repair damage to existing improvements at no cost to the owner.

3.3 PRE-INSTALLATION CONFERENCE

A. The subgrade is to be reviewed by the Architect prior to placing the topsoil.

B. Special considerations for topsoil placement will be reviewed and will include, but not necessarily be limited to special soil mixes for sculpted landforms, sequence of placement of the topsoil, maintenance practices and watering practices.

3.4 PLACING TOPSOIL AT LAWN AREAS

A. Place topsoil in disturbed areas where seeding is indicated.

B. Use topsoil in relatively dry state and place during dry weather.

C. Do not allow wheeled equipment on top of the topsoil. Use only track equipment when working on top of topsoil.

D. Place 4-inches of topsoil on subsoil and till into upper 3- to 6-inches of subsoil as required to facilitate a transition between the topsoil and the subsoil. Place balance of topsoil after subsoil and topsoil have been blended.

E. Cover topsoil with 1-inch of spent mushroom compost and till into top 4- to 6- inches of topsoil as required to achieve a uniform mix.

F. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.

G. Remove stones, roots, grass, weeds, debris, and foreign material over 1-inch in any dimension.

H. Manually spread topsoil around improvements to prevent damage.

I. Lightly compact placed topsoil to 90% modified proctor. Special care shall be taken at locations where topsoil settlement is common such as at the back side of curbs.

3.5 PLANTING BED ESTABLISHMENT

A. Provide beds with straight lines and true arcs according to the configuration delineated on the drawings.

B. Excavate beds for shrub masses and perennials entirely from bed edge to bed edge. Do not treat as individual planting pits.

C. Loosen sub-grade of planting beds to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

D. Remove contaminated subsoil.

E. Spread imported topsoil to depth indicated but not less than required to meet finish grades after light compaction and potential subsequent natural settlement.

F. Do not spread if planting soil or sub-grade is frozen, muddy, or excessively wet.

G. Spread approximately one-half the thickness of imported topsoil over loosened sub-grade. Mix thoroughly into top 2 inches of sub-grade. Spread remainder of on-site topsoil or imported topsoil.

H. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Ensure soils are lightly compacted and positive drainage is achieved.

3.6 PLACING STRUCTURAL SOIL MIX

A. Place structural soil mix in 6-inch lifts.

B. Compact to 95% modified proctor.

C. Conform to CU Structural Soil installation specifications.

3.7 SOIL PREPARATION AT UNDISTURBED AREAS

A. Where lawns, bedding plants, shrub beds, and perennials are to be planted in areas that have not been stripped of topsoil or altered by grading operations, prepare soil as follows:

1. Remove existing grass, vegetation and turf. Do not impact existing vegetation to remain.
2. Dispose of removed material off of Owner’s property. Do not turn debris over into soil.
3. Shrub, Perennial, and Bedding Plant Beds: Amend existing topsoil with one (1) part spent mushroom compost and one (1) part sand per three (3) parts existing topsoil. Till to a depth of not less than twelve (12) inches. Prepare entire breadth of portion of shrub bed that is to be planted; do not limit bed preparation to just the individual shrub planting pit. Amending is to occur in two lifts of 6” deep. Top lift to be removed to facilitate amending bottom lift.
4. Lawn Areas: Till to a depth of not less than four (4) inches except where existing vegetation prohibits extensive disturbance of soil.
5. Remove high areas and fill in depressions.
6. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter.

3.8 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch.

3.9 FIELD QUALITY CONTROL

A. Testing and analysis will be performed under provisions of Division 1.

B. Provide one topsoil test for every 100 cubic yards of imported topsoil and structural soil mix after delivery to Site.

C. Replace or amend any imported topsoil or structural soil in non-conformance.

3.10 CLEANUP

A. Remove excess imported topsoil and subsoil, trash, and debris from the Site and legally dispose of them off Owner's property.

END OF SECTION 329119

SECTION 329219
SEEDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:

1. Seeding or hydro seeding.
2. Lawn renovation.
3. Fertilizing.
4. Mulching.
5. Erosion-control material(s).
6. Maintenance

1.3 RELATED SECTIONS

A. Refer to the following specification sections for related Work.

1. Section 312000 "Earth Moving" for excavation, filling, compaction and rough grading and for subsurface aggregate drainage and drainage backfill materials.
2. Section 328400 “Landscape Irrigation” for coordination with landscape irrigation systems.
3. Section 329119 “Landscape Grading” for topsoil placement and finish grading.
4. Section 329300 “Plants” for coordination with plant material installation.
5. Section 334100 "Storm Utility Drainage Piping" for below-grade drainage of planted areas, paved areas, and wall perimeters.

1.4 REFERENCES

A. AOSA – Association of Official Seed Analysts

B. ASTM D977 – Standard Specification for Emulsified Asphalt.

1.5 DEFINITIONS

A. Backfill: Earth used to replace or the act of replacing earth in an excavation.

B. Finish Grade: Elevation of finished surface of topsoil following natural settling, light rolling or light compaction activities.

C. Installer: The firm performing the seeding work.

D. Sub-grade: Surface or elevation of subsoil remaining after completing excavation, or top

surface of a fill or backfill immediately beneath topsoil.

E. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

F. Substantial Completion: For the purposes of this and related Specification Sections and the scope(s) of work they cover, Substantial Completion refers to a stage in the installation of the project landscape or a portion thereof that is sufficiently complete, in accordance with the contract documents, so that the Owner may use or occupy the space or designated portion thereof for the intended purpose.

G. Topsoil: Imported or native organic soil as specified in Landscape Grading section.

H. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.6 SUBMITTALS

A. Qualification Data: For Installer, including:

1. List of at least five (5) similar completed projects with names, addresses and contact information for each associated Landscape Architect and Owner.
2. Required qualifications of Installer
3. Required qualifications of Installer's project manager and superintendent.

B. Submittals identified below will not be reviewed until the Installer's Qualification Data is reviewed and approved by JQOL.

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

1. Fertilizer: Nitrogen, phosphorus and potassium ratio.
2. Mycorrhizal Fungi Inoculant: Product literature and manufacturer's recommended application rates and practices.

D. Indication of seeding method and equipment to be used.

E. Certification of Grass Seed: From seed vendor for each grass seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Identify source, including name and telephone number of supplier for each seed mixture.
2. Hydro seeding: Slurry contents.

F. Planting Schedule: Indicate anticipated seeding dates.

G. Maintenance Schedule: Provide a customized Schedule of proposed maintenance activities, hours associated with the activities, and their frequencies. This Schedule is to be specific to this Project, include activities associated with the plants of this Project and limited to the Work to be performed by this Contractor. It is not intended to be a list of recommendations for the Owner

after this Contractor is finished with the maintenance requirements of this Project.

H. Maintenance Log:

1. Submit a draft Log format within two weeks after commencement of installation for review and approval.
2. Submit a written record of actual maintenance activities performed during the maintenance period including description of activities, dates, list of personnel involved, and products applied.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified lawn installer with a minimum of five (5) years experience, of work of this type, scale and complexity, whose work has resulted in a successful lawn establishment.

B. The Installer shall have a firm member that holds the following credentials and be available to the project as follows:

1. Hold a minimum of a four (4) year Bachelor's degree in the field of landscape contracting, landscape management, agronomy, landscape architecture or horticulture or be a Certified Landscape Professional by the Professional Landcare Network (PLANET). Non-horticultural degrees in related fields, such as construction management, do not qualify. The intent is to ensure a high level of knowledge and skill as it relates to the horticultural aspects of the project.
2. Have been an employee or owner of the Installer for a minimum of the immediately prior two (2) years. The intent is to ensure the Owner is realizing the benefit of hiring a team of landscape installation professionals that are specifically trained to excel at the installation and establishment of lawns.
3. Be available to respond to inquiries from Architect and Owner.

C. The Installer's project superintendent shall hold the following credentials and be available to the project as follows:

1. Hold a minimum of two (2) year degree in the field of landscape contracting, landscape management, agronomy, landscape architecture or horticulture or be a Certified Landscape Technician – Exterior by the Professional Landcare Network (PLANET). Non-horticultural degrees in related fields, such as construction management, do not qualify. The intent is to ensure a high level of knowledge and skill as it relates to the horticultural aspects of the project.
2. Have been an employee or owner of the Installer for a minimum of the immediately prior two (2) years. The intent is to ensure the Owner is realizing the benefit of hiring a team of landscape installation professionals that are specifically trained to excel at the installation and establishment of lawns.
3. Be present on the project site a minimum of 100% of the time the Installer's crew is present on site.

D. Maintenance Proximity: Not more than 1-hour normal travel time from Installer's place of business to Project site.

E. Pre-installation Conference: Conduct conference at Project site. This Conference will not be scheduled until the landscape contractor's "Installer Qualifications Data" submittal has been

reviewed and approved by JQOL.

F. The Work described in this Section as well as the Landscape Irrigation, Landscape Grading, and Plants sections shall be contracted to a single landscape contractor.

1.8 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies and authorities having jurisdiction for fertilizer and herbicide composition and application.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers. Retain all labels and/or containers in an on-site location, through substantial completion date.

B. Fertilizer: Deliver fertilizer in original sealed, waterproof containers labeled with weight, chemical analysis and manufacturer. Retain all labels and/or containers in an on-site location, through substantial completion date.

1.10 PROJECT CONDITIONS

A. Seeding Restrictions: Sow seed between August 15 and October 15, inclusive. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.11 COORDINATION

A. Coordinate Work of this Section with installation of underground utilities, irrigation system and plant materials. Coordinate as required to determine who is controlling the watering rates and times and ensure rates are appropriate for work of this section and do not harm any other plant material.

1.12 MAINTENANCE SERVICE

A. Initial Lawn Maintenance Service: Provide full maintenance by skilled employees of Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until satisfactory lawn is established, but for not less than the following periods:

1. 60 calendar days from date of Substantial Completion.

a. When initial maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
b. Where installation is phased, continue maintenance until last phase meets requirements.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows, with not less than 85 percent germination, not less than 98 percent pure seed, and not more than 0.5 percent weed seed:

1. Seed Species: Turf type tall fescue and Kentucky bluegrass blend as follows:

a. Four equal parts Fescue seed mix
or
b. Three equal parts (90%) Fescue with (10%) Bluegrass

2.2 PLANTING ACCESSORIES

A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

B. Mycorrhizal Fungi Inoculant:

1. PHC Turf Saver by Plant Health Care, Inc. (800) 421-9051
2. Landscape Inoculant as manufactured by Bio-Organics (888) 332-7676
3. MycoGrow for Lawns by Fungi Perfecti (800) 780-9126
4. Mycor Root Building by GreenSense (800) 864-4445

C. Water: Clean, fresh and free of material harmful to plant growth.

2.3 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-formaldehyde, phosphorous, and potassium in the following proportions:
1. Pre-Seeding Fertilizer: 2:3:1 proportion by weight.
2. Post Establishment Fertilizer: 4:1:2 proportion by weight.

2.4 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, threshed straw of wheat or oats. Hay or chopped cornstalks are not acceptable.

B. Fiber Mulch: Biodegradable, green dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Non-asphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance.

1. Do not seed when soil is wet and unable to support load of equipment.
2. Verify that prepared topsoil is ready to receive work of this Section.
3. Verify that required utilities and planting irrigation are available and ready for use.

B. Proof roll topsoil as required to ensure settling is minimized while ensuring optimum growing conditions for the plant materials.

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

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydro seeding and hydro mulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

C. Apply mycorrhizal fungi inoculant prior to sowing of seed. Apply at a rate and manner as recommended by manufacturer.

3.3 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use same machine used to apply fertilizer.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 8-lbs./1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly with roller not exceeding 90 lbs., and water with fine spray.

D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.4 HYDROSEEDING

A. At Contractor’s option, hydroseeding may be used in lieu of manual fertilizing, seeding and mulching.

B. Hydroseeding: Mix specified seed, mycorrhizal fungi inoculant, fertilizer, and fiber mulch in

water, using equipment specifically designed for hydro seed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with non-asphaltic or fiber-mulch manufacturer's recommended tackifier.
2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.5 LAWN RENOVATION

A. Renovate existing lawn in areas indicated on Drawings or as required to repair damaged existing lawns to remain.

1. Reestablish lawn where settlement or washouts occur or where minor re-grading is required.
2. Provide new topsoil as required.

B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.

C. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, debris, and other construction materials, and replace with new topsoil.

D. Where substantial lawn remains, mow, de-thatch, core aerate, and rake existing lawn.

E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

F. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

1. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil.

G. Surface apply fertilizer to areas of lawn to remain.

H. Apply seed and protect with straw mulch or erosion control fabric as required for new lawns.

1. Seed application method for areas of existing lawn to remain shall be with a slit seeder. No other seeding method will be acceptable.

I. Water newly planted areas as required for new lawn areas.

3.6 LAWN MAINTENANCE

A. Maintain and establish a satisfactory lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, re-grade, and immediately replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
2. Repair eroded areas by filling with topsoil, re-grading, and replanting.

B. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches until Project acceptance.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water lawn with fine spray. Do not use open-ended or nozzled hoses.
3. Water in frequent, short intervals after seeding until seedlings are two (2) to three (3) inches tall. Keep top 1" – 2" of soil moist during this period.
4. Gradually reduce waterings to 2-3 times per week as required to apply 1 inch of water per week. Moisten soil to a 4-inch depth with each watering.

C. Mow lawn as soon as top growth is tall enough to cut. First mowing should not remove more than 10% of the blade. The second mowing should not remove more than 20-30% of the blade. Provide subsequent mowings to specified height without cutting more than 1/3 of grass height. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Third and subsequent mowings to maintain a lawn height of 3-4 inches.

1. Trim edges and hand clip where required.
2. Remove clippings immediately after mowing and clipping.

D. Post-Seeding Fertilization: Apply fertilizer 4-6 weeks after germination and again 8-10 weeks after germination.

1. Use fertilizer that will provide actual nitrogen of at least .75 lb/1000 sq. ft.
2. For fall fertilizations use fertilizer that will provide phosphorous at a rate of .75 lb/1000 sq. ft.

E. Herbicide Treatment: Apply herbicides in accordance with manufacturers written instructions. Correct damage resulting from improper use of herbicides.

F. Provide a log of maintenance activities including dates, hours, equipment used, and complete list of personnel involved. The log is to be signed by an owner's representative after or during each site visit. Payment will not be made without the owner's representative's signature. Log is to be copied to the owner following each visit.

3.7 SATISFACTORY LAWNS

A. Lawn installations shall meet the following criteria as determined by Architect during final inspection and at acceptance:

1. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 95 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches, and with grass height between 3 and 4 inches.

B. Use specified materials to reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory. In areas where lawns require over-seeding to meet specification, over-seeding will be performed using a slit seeder. No other over-seeding method will be acceptable.

C. If satisfactory lawn has not been established at final inspection, another inspection shall be made upon written Contractor request that the lawn is ready for re-inspection, but no earlier than sixty (60) calendar days thereafter.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary 36-inch high fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.

C. Remove non-degradable erosion-control measures after grass establishment period.

D. Allow only vehicles and equipment required to perform and maintain work of this Section onto completed lawn areas.

END OF SECTION 329219

SECTION 329300
PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Trees
2. Shrubs
3. Perennials
4. Tree stabilization
5. Tree root barrier
6. Fertilizing
7. Mulching
8. Maintenance

1.3 RELATED SECTIONS

A. Refer to the following specification sections for related Work:

1. Section 312000 "Earth Moving" for excavation, filling, compaction and rough grading and for subsurface aggregate drainage and drainage backfill materials.
2. Section 328400 “Landscape Irrigation” for coordination with landscape irrigation systems.
3. Section 329119 “Landscape Grading” for topsoil placement and finish grading.
4. Section 329219 “Seeding” for lawn seeding.
5. Section 329443 “Tree Grates and Frames” for coordination with tree grate and paver grate installation.
6. Section 334100 "Storm Utility Drainage Piping" for below-grade drainage of planted areas, paved areas, and wall perimeters.

1.4 REFERENCES

A. ANSI Z60.1, “American Standard for Nursery Stock,” current edition.

1.5 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with caliper size not less than sizes indicated; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.

C. Bare-Root Stock: Exterior plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than caliper size indicated.

D. Clump: Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.

E. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of exterior plant required.

F. Fill Soil: Soil placed with the purpose of elevating the elevation of the sub-grade soils.

G. Finish Grade: Elevation of finished surface of topsoil.

H. Green Waste: Tree and shrub branches, bark, twigs, sticks, leaves, cut foliage, dead-headed flowers, and else removed from trees, shrubs, perennials, annuals and grasses.

I. Installer: The firm performing the installation of the plant material.

J. Multi-Stem: Where three or more main stems arise from the ground from a single root crown or at a point right above the root crown.

K. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

L. Root Flare: The area at the base of the tree's stem or trunk where the stem or trunk broaden to form roots. The area of transition from the root system to the stem or trunk. Also referred to as the "trunk flare".

M. Structural Soil: Manufactured topsoil comprised of a structural crushed stone matrix and a plant sustaining soil capable of providing for the horticultural needs of plant material while ensuring suitable bearing capacity of pavements.

N. Sub-grade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing topsoil.

O. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

P. Substantial Completion: For the purposes of this and related Specification Sections and the scope(s) of work they cover, Substantial Completion refers to a stage in the installation of the project landscape or a portion thereof that is sufficiently complete, in accordance with the contract documents, so that the Owner may use or occupy the space or designated portion thereof for the intended purpose.

Q. Surround Application: Installation method of Tree Root Barrier, surrounding a planting area perimeter.

R. Stem Girdling Root: Roots that substantially or wholly encircle the stem or trunk of a tree in a manner that is or will compromise the health of the tree.

S. Topsoil: Imported or native organic soil as specified in Landscape Grading section.

T. Tree Root Barrier: Plastic mechanical barrier in modular panels used to redirect and guide tree roots down and away from hardscape surfaces.

1.6 SUBMITTALS

A. Qualification Data: For Installer, including:

1. List of at least five (5) similar completed projects with names, addresses and contact information for each associated Landscape Architect and Owner.
2. Required qualifications of Installer
3. Required qualifications of Installer's project manager and superintendent.

B. Submittals identified below will not be reviewed until the Installer's Qualification Data is reviewed and approved by JQOL.

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

D. Samples for Verification: For each of the following:

1. One lb of each type of mulch material, in labeled plastic bags.
2. Tree Root Barrier: One full length panel.

E. List of plant material growers, including names, addresses, contact information and latest date for tagging completion.

F. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis for standard products.
2. Manufacturer's standard literature defining materials for Root Barrier use on the Project.
3. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

G. Root Barrier Quality Control: Complete installation instructions specified, may be combined with product data.

H. Planting Schedule: Indicate anticipated planting dates for exterior plants, including schedule of arrival for plant material.

I. Maintenance Schedule: Provide a customized Schedule of proposed maintenance activities, hours associated with the activities, and their frequencies. This Schedule is to be specific to this Project, include activities associated with the plants of this Project and limited to the Work to be performed by this Contractor. It is not intended to be a list of recommendations for the Owner after this Contractor is finished with the maintenance requirements of this Project.

J. Maintenance Log:

1. Submit a draft Log format within two weeks after commencement of installation for review and approval.
2. Submit a written record of actual maintenance activities performed during the maintenance period including description of activities, dates, list of personnel involved, and products applied.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer with a minimum of five (5) years experience, of work of this type, scale and complexity, whose work has resulted in successful establishment of exterior plants.

B. The Installer's project superintendent shall meet the following criteria:

1. Hold a minimum of a four (4) year Bachelor's degree in the field of landscape contracting, landscape management, agronomy, landscape architecture or horticulture or be a Certified Landscape Technician – Exterior by the Professional Landcare Network (PLANET). Non-horticultural degrees in related fields, such as construction management, do not qualify. The intent is to ensure a high level of knowledge and skill as it relates to the horticultural aspects of the project.
2. Have been an employee or owner of the Installer for a minimum of the immediately prior two (2) years. The intent is to ensure the Owner is realizing the benefit of hiring a team of landscape installation professionals that are specifically trained to excel at the installation and establishment of plant material.
3. Be present on the project site 100% of the time the Installer's crew is present on site.

C. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

1. Tap roots: Tree species that grow with a tap root, that historically has caused an increased mortality rate following transplanting, shall be grown in a manner that is tailored to effect an increased survivability. This growing regimen should include practices such as the use of copper pots, air pruning and frequent digging of field material as required to stunt the growth of the tap root while encouraging the growth of a fibrous root system.

D. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above the ground for trees up to 4-inch caliper size, and 12 inches above the ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

E. Tagging: Allow Architect option of traveling to Grower's facility to select trees from available stock. Allow six (6) weeks, after receipt of list of plant material growers, to complete tagging. Trees dug prior to tagging by Architect are subject to rejection.

1. Contractor to confirm tree health prior to tagging trip. Tagging by architect does not relieve contractor of responsibility for ensuring the trees are vital and healthy trees free of disease, pests and structural problems.
2. Unacceptable trees will not be tagged, and Contractor will select a different grower at no

expense to Owner. A second tagging trip will be scheduled thereafter.

3. Decision by Architect to forego tagging trip does not release Contractor from the responsibility of obtaining plant material which meets standards and conditions.

F. Observation: Architect may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

G. Pre-installation Conference: Conduct conference at Project site. This Conference will not be scheduled until the landscape contractor's "Installer Qualifications Data" submittal has been reviewed and approved by JQOL.

H. The work described within this Section as well as the Landscape Irrigation, Landscape Grading, and Seeding sections shall be contracted to a single landscape contractor.

1.8 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies and authorities having jurisdiction for fertilizer and herbicide composition and application.

1.9 DIGGING, DELIVERY, STORAGE, AND HANDLING

A. Digging Restrictions: Balled and burlapped and bare root plant materials are to be dug within conventional seasonal limitations consistent with good horticultural practices. Deciduous trees and shrubs are to be dug prior to the "rising of the sap" in the spring dig season or after the hardening of the material in the fall dig season.

B. Deliver freshly dug plants.

C. Do not prune trees and shrubs before delivery except as approved by Architect. Protect bark, branches, and root systems from sunscald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during transport and delivery. Do not drop exterior plants during delivery and handling.

D. Handle planting stock by root ball or container.

E. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, heel in exterior plants and trees by setting them in shade, protect from weather and mechanical damage, and keep roots moist. The perimeter of the root ball is to be kept moist at all times. Care will be taken, when using tree bags, to ensure the water is being delivered to the root hairs on the ball perimeter.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

F. Relocating Existing Plant Material: Move existing plants in Spring before leaves appear. Comply with ANSI Z60.1 for root ball size. Cleanly cut roots at ball's surface and do not pull roots from ground. If not replanted within one hour of digging, wrap root ball with burlap and keep moist.

G. Tree Root Barriers:

1. Provide materials in original, unopened containers with manufacturer's labels intact and legible.
2. Store materials in dry area in manufacturer's protective packaging, in original containers with labels and instructions intact.

H. Deliver fertilizer in original sealed, waterproof containers labeled with weight, chemical analysis and manufacturer.

1.10 PROJECT CONDITIONS

A. Planting Restrictions: All plant material is to be planted during a calendar time frame that is consistent with good horticultural practice. The planting is to be completed between March 15 and December 1 of the same calendar year. Additionally, all herbaceous plants of #1 container, one gallon or smaller size shall be planted between March 15 and August 15 in the same calendar year. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed according to manufacturer's written instructions and warranty requirements.

1. Do not install plants when ambient temperatures are forecast to drop below 30 degrees F or rise above 90 degrees F.
2. Do not install plants when wind velocity exceeds, or is forecast to exceed, 30 mph.
3. Do not install plants when ground is frozen, snow-covered, or in an otherwise unsuitable condition.
4. Do not install plants during periods of extreme drought.

C. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to Architect.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

D. Coordinate Work of this Section with installation of underground utilities, irrigation system, and seeding.

1.11 WARRANTY

A. Warranty: Installer's standard form in which Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, abuse by Owner, or incidents that are beyond Contractor's control.
b. Structural failures including plantings falling or blowing over.
c. Faulty operation of tree stabilization and edgings.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods from Date of Substantial Completion:

a. Trees and Shrubs: Minimum of twelve (12) months, including one continuous growing season.
b. Ground Cover, Bulbs, and Perennials: Minimum of twelve (12) months, including one continuous growing season.

3. Include the following remedial actions as a minimum:

a. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
b. Replace exterior plants that are more than 10 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each exterior plant will be required except for losses or replacements due to failure to comply with requirements.
d. Provide extended warranty for replaced plant materials; warranty period equal to original warranty period.

1.12 MAINTENANCE SERVICE

A. Initial Maintenance Service for Trees and Shrubs: Provide full maintenance by skilled employees of Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until plantings are acceptably healthy and well established, but for not less than one growing season or maintenance period below.

1. Maintenance Period: 12 months from date of Substantial Completion.

B. Initial Maintenance Service for Ground Cover, Perennials, and Bulbs: Provide full maintenance by skilled employees of Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until plantings are acceptably healthy and well established, but for not less than one growing season or maintenance period below.

1. Maintenance Period: 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL – GENERAL

A. Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sunscald, windburn, injuries, abrasions, and disfigurement. Provide symmetrically developed plant

material of uniform habit with straight boles and free from objectionable disfigurements. Tree leader shoots shall not be broken or cut. Plants shall have been grown in the same or colder climate zone as this Project location.

B. Quantities: “Planting Plans” supersede “Plant Schedules” on the Drawings.

C. Provide trees and shrubs of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

D. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

E. Label each tree and shrub with securely attached, waterproof tag bearing legible designation of botanical and common name.

F. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height and spread, and number label to assure symmetry in planting.

2.2 SHADE AND FLOWERING TREES

A. Type 1 and Type 2 (Slower Growth) Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

1. Provide balled and burlapped trees.
2. Branching Height: One-third to one-half of tree height.

B. Small Upright Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: Single trunk or multi-stem as indicated.
2. Provide balled and burlapped trees.

C. Small Spreading Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Stem Form: As indicated.
2. Provide balled and burlapped trees.

2.3 DECIDUOUS SHRUBS

A. Form and Size: Shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.

1. Shrub sizes indicated are sizes after pruning.
2. Provide balled and burlapped shrubs.

2.4 BROADLEAF EVERGREENS

A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.

B. Form and Size: Specimen quality as described, symmetrically shaped broadleaf evergreens.

1. Shearing Designation: Natural, never sheared (N).
2. Provide balled and burlapped trees.

2.5 PLANTS

A. Perennials and Bedding Plants: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed, complying with requirements in ANSI Z60.1.

2.6 TREE ROOT BARRIER

A. Acceptable Manufacturers

1. Products specified as standard of quality are manufactured by DeepRoot Green Infrastructure, LLC. (DeepRoot), 530 Washington Street, San Francisco, CA 94111; 800.458.7668; fax 800.277.7668; www.deeproot.com
2. Products meeting standards listed within this specification may be acceptable for use subject to approval of product list and samples.

B. Manufactured Units

1. 12” Depth, UB 12-2

a. Material: black, recyclable, injection molded panel manufactured with 75% reprocessed polypropylene with added ultraviolet inhibitors.
b. Dimensions: 0.080” wall thickness in modules 24” long and 12" deep.
c. Additional specifications:

1) 3/8" wide integral molded 0.060" thickness double top edge with stiffening ribs; bottom edge attached to vertical root deflecting ribs.
2) Integral molded vertical root directing ribs; 0.060" thickness by 1/2" deep spaced at 6" O.C.
3) Integral molded horizontal anti-lift ground lock tabs; 0.060" thickness by 2" long by 1/2" wide; minimum three per panel.
4) Integral zipper joining system for panel connections.

2.7 FERTILIZER

A. Slow-Release Fertilizer for Trees and Shrubs: Tightly compressed tablet fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight.
2. Product: Agriform 20-10-5 Planting Tablets Plus Minus, The Scotts Company, (800) 492-8255.

B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-formaldehyde, phosphorous, and potassium in the following composition:

1. Ratio for Perennial Beds: 1:2:1.
2. Ratio for Bedding Plant Beds: 2:1:1.

2.8 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:

1. Finely ground native hardwood bark.

a. AAA Premium Hardwood Bark Mulch, Tiffany Lawn and Garden Supply, Inc., (317) 228-4900.
b. Forrest Fines, Greendell Mulch & Mix, Mooresville, IN (317) 996-2826
c. Hardwood Fines, Indiana Mulch, Indianapolis, IN (317) 638-8334

B. Mushroom Compost: Spent Mushroom Substrate as defined by the American Mushroom Institute and consisting of well-composted, stable, and weed-free mixture of wheat straw, peat moss, cottonseed meal, cottonseed hulls, corncobs, cocoa bean shells, gypsum, lime, chicken litter, and /or horse stable bedding and free of substances toxic to plantings.

C. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:

1. Type: Rounded, smooth-faced pea gravel.
2. Size Range: three-quarter inch maximum, not less than #8 mesh.
3. Color: Non-uniform but with a predominance of the gray color range, approved by Landscape Architect.

2.9 WEED-CONTROL BARRIERS

A. Filter Fabric: Thermally spunbound landscape fabric suitable for weed control while allowing moisture to pass through.

2.10 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood or redwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes.
3. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Border Concepts, Inc.; Tomahawk Tree Stabilizers.
2) Foresight Products, LLC; Duckbill Rootball Fixing System.

3) Tree Staple, Inc.; Tree Staples.

2.11 MISCELLANEOUS PRODUCTS

A. Antidessicant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch- wide minimum, with stretch factor of 33 percent.

C. Mychorrhizae Inoculant: Provide one of the following:

1. Landscape Inoculant as manufactured by Bio-Organics (888) 332-7676.
2. MycoGrow Soluble for Potting Soils as manufactured by Fungi Perfecti (800) 780-9126
3. Mycor Root Builder by GreenSense (800) 864-4445.

D. Water: Clean, fresh and free of material harmful to plant growth.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas with Installer present to receive exterior plants for compliance with requirements and conditions affecting installation and performance.

1. Locate above and below-grade utilities and perform Work in a manner to prevent damage, hand excavate as required.
2. Verify that required utilities are available and ready for use.
3. Test drainage of beds and pits by filling with water twice in succession. Notify Architect of water retention for longer than 24 hours.
4. If conditions detrimental to plan growth are encountered, such as rubble fill or adverse drainage conditions, notify Architect before proceeding.

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

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

1. Protect grade stakes set by others until directed to remove them.

B. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations with surveyor’s flags, outline planting bed areas, adjust locations when requested, and obtain Architect's acceptance of layout before planting. Make minor adjustments as required.

1. Notify Architect when staking and bed layout is complete and allow one week for adjustments.
2. Plant material installed prior to Architect’s approval of staking and bed outlines is subject to relocation at Contractor’s expense.

C. Apply antidessicant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidessicant at nursery before moving and again two weeks after planting.

D. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 EXCAVATION FOR TREES AND SHRUBS

A. Before planting, restore planting beds if eroded or otherwise disturbed after finish grading.

B. Pits and Trenches: Excavate circular pits with sides sloped inward per planting detail on the drawings.
1. If drain tile is shown or required under planted areas, excavate to top of porous backfill over tile.

C. Subsoil removed from excavations is to be used as backfill. Amend plant pit backfill with 1-part mushroom compost to 2-parts excavated native soil.

D. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

E. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

F. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.4 TREE AND SHRUB PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.

B. Set balled and burlapped and container grown stock plumb and in center of pit or trench with top of root ball 1 inch above adjacent finish grades.

1. Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
2. Place fertilizer and mycorrhizal inoculants prior to backfilling. Provide one ounce of inoculants per inch of stem caliper.
3. Plumb before backfilling and maintain plumb while backfilling.
4. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

C. Form earth saucers around isolated plants of ample size to hold at least 5 gallons for trees and 2-1/2 gallons for shrubs.

D. Mulching: Apply 3-inch (all trees) or 2-inch (all shrubs) average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.

E. Trunk Wrapping: Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping. Wrap thin barked trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Do not wrap prior to October 1 and remove wrap by the following April 1.

3.5 TREE AND SHRUB PRUNING

A. Prune with clean cuts using sharp tools. Do not cut leaders.

B. Remove only dead, dying, or broken branches unless directed otherwise by landscape architect. Do not prune for shape.

C. When specifically directed by landscape architect, prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Prune shrubs to retain natural character. The landscape contractor should anticipate the need to remove the lower limbs of canopy trees as directed by the landscape architect.

D. Promptly treat accidental damage according to standard horticultural practice.

3.6 TREE STABILIZATION

A. Trunk Stabilization: Unless otherwise indicated, provide trunk stabilization as indicated on the Drawings and as follows:

1. Upright Staking and Tying: Stake trees as indicated on Drawings. Use length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend one half of trunk height above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
2. Support trees with flexible ties.

3.7 TREE ROOT BARRIER

A. Verification of Conditions:

1. Verify other work in other sections is complete in order to minimize site impacts by installation of tree root barrier.
2. Any damage to site work due to installation of tree root barrier shall be repaired at the expense of the Contractor.

B. Surround Applications: For installation within individual tree openings or planters that require root barrier protection along all sides of hardscapes.

1. Assemble the appropriate number of root barrier panels using Zipper Joining System.

2. Trench immediately adjacent to hardscape to the appropriate depth for installation of specified root barrier so that top of barrier is ½”-1” (12.7mm to 25.4mm) above finished soil grade.
3. Place root barrier in trench, vertical ribs facing toward planting area and tree roots.
4. Where possible, use hardscape as a guide for root barrier alignment.
5. Backfill adjacent planting soil against the root barrier to promote clean fit to hardscape. Fill to finish grade per project specifications.
6. Distribute soil evenly to maintain the shape of the root barrier and compact per project specifications.

3.8 PERENNIAL AND BEDDING PLANT PLANTING

A. Set out and space perennial and bedding plants as indicated. Do not damage roots by separating individual plants.

B. Dig holes large enough to allow spreading of roots and backfill with planting soil.

C. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

E. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

F. At Contractor’s option, perennial and bedding plants may be planted following mulching.

3.9 Tree Root Barrier Surround Applications

1. For installation within individual tree openings or planters that require root barrier protection along all sides of hardscapes.

    a. Assemble the appropriate number of root barrier panels using Zipper Joining System.
    b. Trench immediately adjacent to hardscape to the appropriate depth for installation of specified root barrier so that top of barrier is ½”-1” (12.7mm to 25.4mm) above finished soil grade.
    c. Place root barrier in trench, vertical ribs facing toward planting area and tree roots.
    d. Where possible, use hardscape as a guide for root barrier alignment.
    e. Backfill adjacent planting soil against the root barrier to promote clean fit to hardscape. Fill to finish grade per project specifications.
    f. Distribute soil evenly to maintain the shape of the root barrier and compact per project specifications.

3.10 PLANTING BED MULCHING

A. Mulch backfilled surfaces of planting beds and other areas indicated within 24 hours of planting. Provide mulch ring around trees in lawn areas.

1. Organic Mulch: Apply 2-inch average thickness of organic mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

B. Tree Grates and Paver Grates: Apply 2-inch average thickness of mineral mulch as indicated. Do not place mulch against plant stems.

C. Do not contaminate mulch with planting soil mix.

3.11 EDGING INSTALLATION

A. Spade Edging: Uniformly edge using a sharp mechanically powered tool to provide a clear cut between planting beds and adjacent lawn as indicated on the Drawings. Edges are to be straight lines and true curve geometry as depicted on the drawings.

3.12 PLANT MAINTENANCE

A. Tree and Shrub Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, adjusting and repairing stakes and guy supports and root-ball stabilization, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.

B. Perennial and Bedding Plant Maintenance: Maintain and establish plantings by watering, weeding, fertilizing, mulching, and other operations as required to establish healthy, viable plantings.

C. Fertilize in accordance with manufacturer’s written instructions and grower’s recommendations.

D. Provide a log of maintenance activities including dates, hours on-site, equipment used, and complete list of personnel involved. The log is to be signed by an owner’s representative after or during each site visit. Payment will not be made without the owner’s representative’s signature. Log is to be copied to the owner following each visit.

3.13 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Promptly treat, repair, or replace damaged plantings.

3.14 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 329300

SECTION 329443
TREE GRATES AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Tree grates and frames as shown on Drawings and as specified herein.

1.3 RELATED SECTIONS

A. Refer to the following specification sections for related Work:

1. Section 312000 "Earth Moving" for excavation, filling, compaction and rough grading and for subsurface aggregate drainage and drainage backfill materials.
2. Section 328400 “Landscape Irrigation” for coordination with landscape irrigation systems.
3. Section 329119 “Landscape Grading” for topsoil placement and finish grading.
4. Section 329219 “Seeding” for lawn seeding.
5. Section 329300 “Plants” for coordination with plant material installation.
6. Section 334100 "Storm Utility Drainage Piping" for below-grade drainage of planted areas, paved areas, and wall perimeters.

1.4 SUBMITTALS

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

B. Shop Drawings: Show the following:

1. Layout, profiles, anchorages, accessories and installation details.

C. Samples for Verification: For each type of product indicated.

D. Qualification Data: For Installer and Manufacturer.

E. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Two years minimum experience installing tree, drain, or trench grates and support frames.

B. Manufacturer’s Qualifications: Fifteen years minimum experience in cast grate manufacturing.

C. Source Limitations: Obtain tree grate and frame materials through one source from a single

manufacturer.

1.6 PROJECT CONDITIONS

A. Delivery, Storage and Handling: Store product in manufacturer’s packaging until ready to install.

1.7 COORDINATION

A. Coordinate installation of tree grate and paver grate support frames with installation of concrete substrate specified in Division 32 Section "Concrete Paving."

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of tree grates and frames that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TREE GRATES AND FRAMES

A. Basis of Design Manufacturer:

1. IRON AGE DESIGNS, 2104 WE 152nd ST. STE #4, BURIEN, WA 98166, (877)418-3568

B. Products:

1. Tree Grate: RAIN, 72-inch by 72-inch tree grate, in quarters, 1/2-inch maximum slot openings for ADA compliance, 12-inch tree opening, secured with pilfer- proof bolts/screws, as shown on Drawings.

C. Tree grate material shall be cast gray iron from 100% recycled materials. All tree grate castings shall be manufactured true to pattern and component parts, and shall fit together in a satisfactory manner. The castings shall be of uniform pattern quality, free from blowholes, hard spots, shrinkage, distortion or other defects. Castings shall be cleaned by shot blasting.

D. Finish: Tree grates are to be supplied with baked on oil finish.

E. Matching steel angle frames provided by tree grate manufacturer shall be provided with installation details as shown on Drawings. Frames to be provided unfinished.

2.2 ACCESSORIES

A. Pilfer-proof Bolts/Screws: Provide pilfer-proof bolts/screws per manufacturer’s standard.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2, AASHTO M 288.
2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Do not begin installation until site is properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare the surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION, GENERAL

A. General: Comply with tree grate manufacturer's written installation instructions.

B. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

3.4 TREE GRATE INSTALLATION

A. Tree Grate Frames:

1. Install steel angle frame flush and leveled with surrounding paving surface. Maintain flush and leveled at all times. Frames must not slope in more than one direction.
2. Use spreaders or stakes to keep frame from being distorted by concrete pressure.
3. Install frames per details on Drawings and manufacturer’s recommendations.

B. Clean concrete and debris from frame prior to tree grate installation.

C. Install tree grates after danger of damage from construction traffic has passed.

D. If needed, grind pads on underside of tree grates to level and prevent rocking in frame.

3.5 CLEAN-UP AND PROTECTION

A. Protect installed product until completion of project.

B. DO NOT ALLOW water from new concrete to run off or wash onto grates to prevent damage from concrete exudates, lime, and efflorescence. Protect or remove grates if surrounding surface is to be acid washed.

C. Touch up, repair or replace damaged products.

D. DO NOT ALLOW ANY CONTAMINATION OF TREE PLANTING AREA! This includes, but is not limited to, construction debris, excess concrete, paint or other chemical contaminants. Any contamination of the planting area may be detrimental to the long-term health of the tree.

END OF SECTION 329443

SECTION 334100
STORM UTILITY DRAINAGE PIPING

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. Pipe and fittings.
2. Cleanouts.
3. Manholes.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

1.4 ACTION SUBMITTALS

A. Product Data with Shop Drawings:

1. Product Data: For each type of product indicated.
2. Shop Drawings:

a. Manholes: Include plans, elevations, sections, details, frames, and covers.
b. Include plans, elevations, sections, details, frames, covers, and grates.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

B. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of service.

2. Do not proceed with interruption of service without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
9. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
2. Install piping with 36-inch minimum cover.

3.3 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.

B. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.4 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.5 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

    a. Unshielded flexible couplings for same or minor difference OD pipes.
    b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
    c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure-type pipe couplings for force-main joints.

3.6 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:

1. Remove manhole or structure and close open ends of remaining piping.
2. Remove top of manhole or structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Division 31 Section "Earth Moving."

END OF SECTION 334100

SECTION 334419.15
STORMWATER HYDRODYNAMIC GRIT SEPARATOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes following:

1. Stormwater treatment system.

B. Related Sections include following:

1. Division 33 Section "Storm Utility Drainage Piping."

1.3 PERFORMANCE

A. Stormwater Treatment System shall include a 3-1/4-inch inner diameter (ID) circular hydrodynamic flow-through treatment chamber to treat incoming water. A tangential inlet shall be provided to induce a swirling flow pattern that will cause sedimentary solids to accumulate in bottom center of chamber in such a way as to prevent re-suspension of captured particles. An arched baffle wall shall be provided in such a way as to prevent floatable liquid oils and solids from exiting treatment chamber while enhancing swirling action of stormwater.

B. Stormwater treatment system shall have a sediment storage capacity of 20 cubic feet and be capable of capturing 110 gallons of petroleum hydrocarbons. Stormwater treatment system shall have a treatment capacity of 1.1 cubic feet per second (cfs). Stormwater Treatment System shall be capable of removing floating trash and debris, floatable oils and 80 percent of total suspended solids from stormwater entering treatment chamber.

C. Service access to stormwater treatment system shall be provided via 30-inch inner diameter (ID) access riser(s) over treatment chamber such that no confined space entry is required to perform routine inspection and maintenance functions.

1.4 QUALITY CONTROL INSPECTION

A. Materials

1. Quality of materials, process of manufacture, and finished sections shall be subject to inspection by Engineer. Such inspection may be made at place of manufacture, or on Work site after delivery, or at both places.

2. Sections shall be subject to rejection at any time, if material conditions fail to meet specification requirements, even though sample sections may have been accepted as satisfactory at place of manufacture. Sections rejected after delivery to Site shall be marked for identification and shall be removed from Site at once. All sections which are damaged beyond repair after delivery will be rejected and, if already installed, shall be repaired to Engineer's acceptance level, if permitted, or removed and replaced with new, entirely at Contractor's expense.

B. Inspection

1. All sections shall be inspected for general appearance, dimensions, soundness, etc.

C. Defects

1. Structural defects may be repaired, subject to acceptance of Specifying Engineer, after demonstration by manufacturer that strong and permanent repairs can be made. Engineer will carefully inspect repairs before final acceptance of components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Basis of Design: Subject to compliance with requirements, provide "Aqua-Swirl Concentrator, Model No. AS 3" as manufactured by AquaShield, Inc.; 423-870-8888 or comparable product by one of following:

1. ADS
2. CDS Technologies
3. Downstream Defender
4. Stormceptor
5. Vortechs

2.2 MATERIALS

A. Stormwater Treatment System shall be made from high-density polyethylene (HDPE) resins meeting following requirements:

1. HDPE Material – HDPE material supplied under this specification shall be high-density, high-molecular weight as supplied by manufacturer. HDPE material shall conform to ASTM D3350-02 with minimum cell classification values of 345464C.
2. Physical Properties of HDPE Compound

a. Density - density shall be no less than 0.955 g/cm3 as referenced in ASTM D 1505.
b. Melt Index - melt index shall be no greater than 0.15 g/10 minutes when tested in accordance with ASTM D 1238- Condition 190/2.16.
c. Flex Modulus - flexural modulus shall be 110,000 to less than 160,000 psi as referenced in ASTM D 790.

d. Tensile Strength at Yield - tensile strength shall be 3,000 to less than 3,500 psi as referenced in ASTM D 638.
e. Slow Crack Growth Resistance shall be greater than 100 hours (PENT Test) as referenced in ASTM F 1473 or greater than 5000 hours (ESCR) as referenced in ASTM D 1693 (condition C).
f. Hydrostatic Design Basis shall be 1,600 psi at 23 degrees C when tested in accordance with ASTM D 2837.
g. Color – black with minimum 2% carbon black.

B. REJECTION - Stormwater treatment system may be rejected for failure to meet any requirements of this specification.

2.3 TREATMENT CHAMBER CONSTRUCTION

A. Treatment chamber shall be constructed from solid wall high-density polyethylene (HDPE) ASTM F 714 cell class 345464C. For sizes above 63-inch OD, the treatment chamber shall be constructed from profile wall HDPE ASTM F 894 RSC 250 pipe or solid wall HDPE.

B. Bottom thickness of treatment chamber shall be determined in accordance with ASTM F 1759. Calculations shall be provided to verify thickness of bottom.

C. Inlets and outlets shall be extrusion-welded on inside and outside of structure using accepted welding practice.

D. Arched baffle wall shall be constructed from HDPE and shall be Extrusion-welded to interior of treatment chamber using accepted welding methods with connections made at 180 degrees of each end.

E. HDPE lifting supports may be provided on exterior of Stormwater Treatment System in such a way as to allow prevention of undue stress to critical components of Stormwater Treatment System during loading, off-loading and moving operations. Lifting supports shall be constructed as an integral part of treatment chamber and extrusion-welded using accepted welding practices.

F. Top of treatment chamber shall be built to requirements of Drawings. Deep burial applications shall require a reinforced HDPE top. Reinforced concrete pads spanning treatment chamber will be required with traffic rated frames and covers when Stormwater Treatment System is used in traffic areas. A professional engineer shall approve design of concrete pad and stamped calculations shall be included in submittal. Upon request manufacturer shall supply anti-flotation/ buoyancy calculations. In addition, typical drawings of stormwater treatment system with concrete anti-flotation structures shall be provided. Anti-flotation structure design and approval are responsibility of Engineer. Contractor shall provide anti-flotation structures.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation and Bedding

1. Trench and trench bottom shall be constructed in accordance with ASTM D 2321, Section 6, Trench Excavation, and Section 7, Installation. HDPE Stormwater Treatment System shall be installed on a stable base consisting of 12 inches of Class I stone materials (angular, crushed stone or rock, crushed gravel; large void content, containing little or no fines) as defined by ASTM D 2321, Section 5, Materials, and compacted to 95% proctor density.
2. All required safety precautions for Stormwater Treatment System installation are responsibility of Contractor.

B. Backfill Requirements

1. Backfill materials shall be Class I or II stone materials (well graded gravels, gravelly sands; containing little or no fines) as defined by ASTM D 2321, Section 5, Materials and compacted to 90% proctor density. Class I materials are required. Backfill and bedding materials shall be free of debris. Backfilling shall conform to ASTM F 1759, Section 4.2, "Design Assumptions ." Backfill shall extend at least 3.5 feet beyond edge of storm water treatment system for full height to sub-grade and extend laterally into undisturbed soils.

C. Pipe Couplings

1. Pipe couplings to and from stormwater treatment system shall be flexible boot with stainless steel tension bands. A metal sheer guard shall be used to protect flexible boot.

3.2 DIVISION OF RESPONSIBILITY

A. Stormwater Treatment System Manufacturer

1. Manufacturer shall be responsible for delivering stormwater treatment system to Site. System includes treatment chamber with debris baffle, inlet and outlet stub-outs, lifting supports, 30-inch ID service access riser(s) to grade with temporary cover, and manhole frame(s) and cover(s).

B. Contractor

1. Contractor is responsible for preparing Site for system installation including, but not limited to, temporary shoring, excavation, cutting and removing pipe, new pipe, bedding, and compaction. Contractor shall be responsible for furnishing means to lift system components off delivery trucks. Contractor shall be responsible for providing concrete anti-floatation/anti-creep restraints, anchors, collars, etc. with straps or connection devices required. Contractor shall be responsible for field cutting, if necessary, HDPE service access risers to grade. Contractor shall be responsible for sealing pipe connections to stormwater treatment system, backfilling and furnishing all labor, tools, and materials needed.

END OF SECTION 334419.15