TECHNICAL SPECIFICATIONS BOOK FOR

BUILDING 149 - FORT ALLEN

2G43, AVE A. MERCEDITA,
JUANA DÍAZ, 00715, PUERTO RICO

100% BIDDING SET
NOT FOR CONSTRUCTION

UPDATED – NOVEMBER 4TH, 2024.

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C.A ᴀ P P R. / S.C.A. / A.I.A

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TECHNICAL SPECIFICATIONS FOR

BUILDING 149 – FOR ALLEN

2G43, AVE A. MERCEDITA,
JUANA DÍAZ 00715, PUERTO RICO

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DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Coordination Drawings.
3. Administrative and supervisory personnel.
4. Project meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Indicate relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing.
    d. Sustainable products, processes, and documentation.
    e. Designation of responsible personnel.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for processing Applications for Payment.
    h. Distribution of the Contract Documents.
    i. Submittal procedures.
    j. Preparation of Record Documents.
    k. Use of the premises.

l. Responsibility for temporary facilities and controls.
m. Parking availability.
n. Office, work, and storage areas.
o. Equipment deliveries and priorities.
p. First aid.
q. Security.
r. Progress cleaning.
s. Working hours.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related Change Orders.
d. Purchases.
e. Deliveries.
f. Submittals.
g. Review of mockups.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Required performance results.
u. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements.
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve

impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Status of recycling and waste disposal.
        5) Deliveries.
        6) Off-site fabrication.
        7) Access.
        8) Site utilization.
        9) Temporary facilities and controls.
        10) Work hours.
        11) Hazards and risks.
        12) Progress cleaning.
        13) Quality and work standards.
        14) Change Orders.
        15) Documentation of information for payment requests.

3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Material recycling reports.
8. Special reports.

B. Related Sections include the following:
1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.
5. Division 1 Section "Construction Photographs" for documenting existing and new conditions.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

C. Event: The starting or ending point of an activity.

D. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

E. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

F. Major Area: A story of construction, a separate building, or a similar significant construction element.

G. Milestone: A key or critical point in time for reference or measurement.

H. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Sequence of finishes work.
7. Scheduled date for Architect's final release or approval.

C. Preliminary Construction Schedule: Submit two printed copies; one a single sheet of reproducible media, and one a print.

D. Preliminary Network Diagram: Submit two printed copies; one a single sheet of reproducible media, and one a print; large enough to show entire network for entire construction period.

E. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule.

F. Daily Construction Reports: Submit two copies at weekly intervals.

G. Material Location Reports: Submit two copies at weekly intervals.

H. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

I. Special Reports: Submit two copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including area separations, interim milestones.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary construction schedule. Include submittals required during the first 45 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than two days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
2. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use of premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Sustainable construction practices.
i. Environmental control.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.

F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 45 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Meetings and significant decisions.
7. Recycled products and waste removal.
8. Unusual events (refer to special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Construction Change Directives received.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial Completions and occupancies.
18. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

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

END OF SECTION 01320

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01 33 00

SUBMITTALS PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL FORM AND LOG

A. The Contractor shall use the submittal form and log at the end of this section or use alternates acceptable to the Owner.

B. Architect will return submittals without processing if they do not contain Contractor's stamp, if they are not initialed or signed by authorized person, if they are not dated, or if it becomes evident that they have not been properly reviewed. Delays resulting there from are the responsibility of the Contractor.

C. Contractor shall maintain in field office a copy of submittal schedule and log of submittals indicating current status of each item.

D. Contractor shall allot time in construction scheduling for liaison with Architect for review of submittals. Except for special submittals, such as those with design calculations and/or detailed shop drawings, submittals will be reviewed in an average time of ten *(10)* working days.

1.2 REQUEST FOR INFORMATION (RFI) FORM AND LOG

A. The Contractor shall use the RFI form at the end of this section or use an alternate form acceptable to the Owner.

B. Contractor shall carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Architect of any error, inconsistency, omission, or apparent discrepancy discovered.

C. Contractor shall allot time in construction scheduling for liaison with Architect for handling queries and clarifications.

D. If Architect is able to respond to a request for information by making specific reference to Drawing sheet or Specification Section, the Owner retains the right to require the Contractor to reimburse Owner for charges of Architect and Architect's Consultants for performing review services for the Contractor.

E. Contractor shall maintain in field office a copy of the log of RFIs indicating current status of each item.

1.3 SHOP DRAWINGS

A. Contractor shall bind in complete sets. Transmit reproducible transparencies in roll form to eliminate folding. Folding of prints is acceptable.

B. Contractor shall allot time in construction scheduling for liaison with Architect for review of shop drawings. Except for special submittals, such as those with design calculations and/or detailed shop drawings, submittals will be reviewed in an average time of ten *(10)* working days.

C. Contractor shall present in clear and thorough manner. Title each drawing with Project name and number; identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.

D. Contractor shall show detail, materials, dimensions, thickness, methods of assembly, attachments, relation to adjoining work, and other pertinent data and information.

E. Contractor shall verify dimensions and field conditions. Clearly indicate field dimensions and field conditions.

F. Contractor shall not use Contract Drawings for shop drawings. Provide original shop drawings with changes from Contract Drawings clearly indicated.

G. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:
    A. Project name
    B. Date
    C. Name and address of Contractor
    D. Name and address of supplier
    E. Name of manufacturer
    F. Unique identifier, including revision number
    G. Drawing number and detail references, as appropriate

H. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

1.4 PARTIAL SUBMITTALS

Architect will not review partial or incomplete submittals. Complete submittals for each item are required. Submittals will not be considered official until it is complete in every respect. Delays resulting from partial submittals are the responsibility of the Contractor.

1.5 RESUBMITTALS

A. Make resubmittals under procedures specified for initial submittals; identify changes made since previous submittal.

B. Architect will record time required to review resubmittals after original submittal and first resubmittal. Owner retains the right to require the Contractor to reimburse Owner for charges to Architect and Architect's Consultants for reviewing submittal more than 2 times.

1.6 DISTRIBUTION

A. Duplicate and distribute reproductions of shop drawings, product data, samples, and other submittals which bear Architect's stamp of approval to the Project record documents file, the Project site file, subcontractors, suppliers, other affected contractors, and other entities requiring information.

B. Provide each testing and inspection agency one set of approved submittals for their exclusive use in providing specified quality control testing and inspection services; refer to Section 01 40 00.

C. The Owner is to receive two copies of all approved submittals, shop drawings and product data.

SUBMITTAL FORM (Submit separate form for each product)

Contractor: Project:

TRANSMITTAL A To: Contractor _____ Date: _____ Submittal No: _____

From: Subcontractor _____ By: _____ Resubmission ❒

Quantity	Reference Number	Title/Description/ Manufacturer	Specification Section Title, Paragraph / Drawing Detail Reference

❒ Submitted for Review and Approval
❒ Resubmitted for Review and Approval
❒ Complies with Contract Requirements
❒ Will be available to meet construction schedule
❒ A/E Review Time included in construction schedule
Other remarks on above submission:

❒ Substitution Involved - Substitution Request Attached
❒ If Substitution involved, Submission includes full point by point comparative data or Preliminary details
❒ Items included in Submission will be ordered immediately upon receipt of approval

TRANSMITTAL B To: A/E - Attention _____ Date Received by Contractor: _____

From: Contractor _____ Date Transmitted by Contractor: _____

Reviewed, Coordinated, and Approved by Contractor

Remarks on above submission:

One copy retained by sender

TRANSMITTAL C To: Contractor _____ Date Received: _____

From: A/E ❒ Other Signed _____ Dated Returned: _____

❒ Approved
❒ Approved as noted
❒ Disapproved / Resubmit
❒ Not subject to review
❒ Submission Incomplete; Resubmit
❒ Received; No Action Required
❒ Full point by point comparative data required to complete approval process
❒ Provide File Copy with corrections identified
❒ Reproducible copies only returned

Remarks on above submission:One copy retaine

TRANSMITTAL D To: Subcontractor _____ Date Received: _____

From: Contractor Signed _____ Dated Returned: _____

Copies ❒ University ❒ ❒ ❒One copy retained by sen
Remarks on above:

Include GC Section 24 required stamp here

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART I. GENERAL

1.1 SCOPE

A. Field engineering and surveying
B. Preparation and examination
C. Inspection and testing

1.2 GENERAL REQUIREMENTS

A. The work of this section is governed by the conditions set forth in the Agreement between the Owner and Contractor, the General Conditions of the Contract for Construction, Division 1 of these Specifications, and all other documents that make up the Agreement.
B. The Contractor shall ensure that the work of this section is coordinated with the work of all related trades affected by or affecting the work of this Section.

1.3 RELATED SECTIONS

A. General Conditions, Division 0
B. Summary of Work and Basic Requirements, Section 01100
C. Pricing and Payment Procedures, Section 01210
D. Submittals and Substitutions, Section 01300
E. Administrative Requirements, Section 01311
F. Quality Requirements, Section 01400
G. Cutting and Patching, Section 01450
H. References and Definitions, Section 01460
I. Temporary Facilities and Controls, Section 01500
J. Protection and Closeout Requirements, Section 01700

1.4 INSPECTION AND TESTING

A. The contractor shall be responsible for contacting and coordinating with the testing agency and scheduling tests, as they are required.
B. The contractor shall complete and pay for all threshold and special engineering inspections. The contractor shall retain the services of a licensed engineer for these inspection services.
C. The tests that are required are as follows. These are in addition to tests required of each Section or as required by the Architect, Engineer or local code officials during the course of Construction:
    1. Soils testing.
    2. Concrete samples and testing.
    3. Tests as noted in Mechanical section of these Specifications and Drawings.
    4. Tests as noted in the Structural Sections of these Specifications and Drawings.
    5. Slab moisture test (aluminum chloride).
    6. Threshold Inspections.
    7. Testing and Balancing as noted in Mechanical section of the Specifications and Drawings.
D. Repair and/or replacement of work not conforming to the Specifications of this

Project and the re-testing of this work, shall be performed by the Contractor at no additional cost to the Owner.

E. The Contractor shall pay an independent testing agency to perform tests and Controlled Inspections required under this contract. The independent testing agency shall be acceptable to the Architect, Engineer and Owner.

F. All testing reports shall be submitted in two (2) copies each to the Architect and to the Owner.

1.5 FIELD ENGINEERING AND SURVEYING

A. It is the contractor's responsibility to ensure that the building is placed as shown on the drawings and all datum are correct.

B. The Contractor shall hire an independent surveyor to verify location of foundation as required by the local building officials prior to start of framing. Contractor shall coordinate this work and ensure that the proper submittals are made to the local building department.

C. The Contractor shall be responsible for verifying all field measurements and site conditions as they pertain to general layout of the Building and the Shop Drawings.

1.6 PREPARATION AND EXAMINATION

A. Clean all surfaces prior to applying next material.

B. Prepare all surfaces including priming, cleaning, and application of sealer or bonding agent as per manufacturer's written specifications.

C. Verify that existing site and substrate conditions are acceptable prior to starting subsequent Work. Beginning of new Work is an implied acceptance of the existing conditions.

D. All substrates shall be prepared for the finish work as required of each Section. Contractor shall be responsible for coordinating the work of all trades to ensure that all work is properly prepared.

E. Coordinate the work of all trades to ensure that all work is properly prepared.

F. When requested by the Architect, the Contractor shall obtain written confirmation by subcontractors of the acceptance of substrates prior to starting their respective work.

END OF SECTION

SECTION 01 45 16

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION REQUIREMENTS INCLUDE

A. General Quality Control

B. Workmanship

C. Manufacturer's Instructions

D. Manufacturer's Certificates

E. Manufacturer's Field Services

1.2 QUALITY ASSURANCE - CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Materials and workmanship not meeting the requiredstandards or performance obligations shall be removed and replaced at the Contractor's expense, including subsequent testing.

C. Comply with manufacturers' instructions.

D. Comply with specified standards as minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate more rigid standards or more precise workmanship.

1.3 WORKMANSHIP

A. Perform work by persons qualified to produce workmanship of specified quality.

B. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.4 MANUFACTURERS' INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Architect

before proceeding.

1.5 MANUFACTURERS' CERTIFICATES

A. When required by individual Specifications Section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.6 MANUFACTURERS' FIELD SERVICES

A. When specified in respective Specification Sections, require manufacturer to provide qualified personnel to observe field conditions, conditions of surface and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.

B. Representative shall submit written report to Architect listing observations and recommendations.

1.7 MOCK-UPS

A. Test mock-up will, be required in some activities as determine by Architect or Owner. And shall be performed under the provisions identified in this section and identified in the respective product specification.

B. Accepted Mock-ups are representative of the quality required for the work.

C. Where mock-ups has been accepted by Architect or Owner and is specified in product specification sections to be removed; remove mock-ups and clear area when directed to do so.

D. Accepted Mock-ups can be made part of the Project if Accepted by Architect or Owner.

2 PRODUCTS (NOT APPLICABLE)

3 EXECUTION (NOT APPLICABLE)

END OF SECTION 01 45 16

SECTION 01 50 00

TEMPORARY FACILITIES

1. GENERAL

The Contractor shall provide all temporary facilities necessary for the proper completion of the work, as necessary and as specified.

The Contractor's attention is directed to the requirements of the GENERAL SPECIFICATIONS specified under "Sanitary Regulations", "Precautions During Adverse Weather", and "Electrical Energy".

2. WATER SUPPLY

The Contractor shall make arrangements and pay for all water necessary for completion of construction operations under this contract.

3. PROJECT SIGN

The Contractor shall construct a sign having an area of approximately 96 sq. ft. identifying the project, officials representing the Owner representatives, the Architects, etc. The sign shall be erected in a location selected by the Architect. The Contractor shall maintain the sign throughout the duration of the project. The sign shall be worded as directed by the Architect. See sign details on drawing sheets inside the drawings.

4. CONTRACTOR'S FIELD OFFICE

The Contractor shall maintain a temporary field office near the work for his own use during the period of construction at which readily accessible copies of all contract documents shall be kept. The office shall be located where it will not interfere with the progress of the work. In charge of this office there shall be a competent superintendent of the Contractor as specified under "Supervision of Work" in the AGREEMENT.

5. OFFICE FOR ARCHITECT

Promptly after starting work at the site, the Contractor shall provide and equip a suitable area in the Contractor's trailer (at least 100 sq. ft. of floor area) for the exclusive use of the Architect, and the Contractor shall maintain this office thereafter until the completion of the
work to be done under this contract. The office for the Architect shall be a separate room which can be locked. A key to the trailer and the office for the Architect shall be furnished to the Architect.

The office, furniture, equipment, supplies and services necessary shall be satisfactory to the

Architect. The Contractor shall furnish the following furniture, equipment, supplies, and

services:

a. One plan table or sloping plan shelf, about 3 ft. by 5 ft., with reasonable smooth top, and one suitable swivel stool.

b. Two additional chairs.

Four-drawer, legal size, vertical metal filing cabinet with lock

c. Desk for general office use, about 2.5 ft. by 5 ft., with desk chair of the armchair swivel type.

d. Telephone extension on desk.

e. Calculating machine, electric or electronic.

f. Air conditioning unit of adequate capacity to maintain a minimum temperature differential of 20 deg. F from ambient under the most serious conditions.

g. Sanitary facility separate from, but in the immediate vicinity of the Architects office.

h. Drinking water either through a refrigerated fountain connected to potable water supply or ice water furnished daily for the Architect office.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:
1. Division 1 Section "References" for applicable industry standards for products specified.
2. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.
4. Division 1 Section "Environmental Procedures" for recycled-content product requirements.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service

performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:

    a. Specification Section number and title.
    b. Generic name used in the Contract Documents.
    c. Proprietary name, model number, and similar designations.
    d. Manufacturer's name and address.
    e. Supplier's name and address.
    f. Installer's name and address.
    g. Projected delivery date or time span of delivery period.
    h. Identification of items that require early submittal approval for scheduled delivery date.

3. Completed List: Within 30 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified material or product cannot be provided.
    b. VOC content, recycled content and additional sustainable product requirements specified.
    c. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

d. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
e. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
f. Samples, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
j. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Provide products with energy efficient designs and with materials complying with environmental protection considerations.

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

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products to allow for inspection and measurement of quantity or counting of units.
6. Store materials in a manner that will not endanger Project structure.
7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
9. Protect stored products from damage.

B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.

    a. Substitutions may be considered, unless otherwise indicated.

2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.

    a. Substitutions may be considered, unless otherwise indicated.

3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

    a. Substitutions may be considered, unless otherwise indicated.

4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

    a. Substitutions may be considered, unless otherwise indicated.
5. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Substitutions may be considered, unless otherwise indicated.

6. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.

    a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

7. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

8. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 30 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
11. Requested substitution complies with specified VOC and recycled materials requirements.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01600

SECTION 01 70 00
PROJECT CLOSEOUT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS

A. Definitions: Project closeout is the term used to describe certain collective project requirements, indicating completion of the Work that are to be fulfilled near the end of the Contract time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment to the Contractor and the normal terminations of the contract.

a. Specific requirements for the individual units or work are included in the appropriate sections in Divisions 2 through 16.

b. Time of closeout is directly related to “Substantial Completion”; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this section.

1.3 PRE-REQUISITES TO SUBSTANTIAL COMPLETION

A. General: Complete the following before requesting the Architect/Engineer’s inspection for certification of substantial completion, either for the entire Work or for portions of the Work. List known exceptions in the request. The following items must be completed prior to requesting an inspection:

a. Receive a “Certificate of Occupancy” from the permitting agency.

b. Receive all final inspections and certifications from all permitting agencies. All open permits shall be fully closed out and documentation indicating so shall be provided to the Owner with copies to the Architect.

c. All finishes and furnishing specified as part of the contract shall be installed and ready for immediate use by the Owner.
d. All warranties (including, but not limited to, the roof warranties) shall be fully executed and issued to the Owner with a copy to the Architect.
e. All items previously indicated by the Owner or Architect during field inspections shall be completed.

B. In the progress payment request that coincides with, or is the first request following, the date substantial completion is claimed, show either 100% completion for the portion of the Work claimed as "substantially complete", or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete.
a. Include supporting documentation for completion as indicated in these contract documents.
b. Submit a statement showing an accounting of changes to the Contract Sum.
c. Advise Owner of pending insurance changeover requirements.
d. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
e. Obtain and submit releases enabling the Owner's full, unrestricted use of the Work and access to services and utilities. Where required, include occupancy permits, operating certificates and similar releases.
f. Deliver tools, spare parts, extra stock of material and similar physical items to the Owner.

C. Make the final changeover of locks and transmit the keys to the Owner. Advise the Owner's personnel of the changeover in security provisions.

D. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock-ups and similar elements.

E. Complete final cleaning up requirements, including touch-up painting of marred surfaces.

F. Touch-up and otherwise repair and restore marred exposed finishes.

G. Inspection Procedures: Upon receipt of the Contractor's request for inspection, the Architect/Engineer will wither

proceed with inspection or advise the Contractor of unfilled prerequisites.

a. Following the initial inspection, the Architect/Engineer will either prepare the certificate of substantial completion, or will advise the Contractor of work which must be performed before the certificate will be issued. The Architect/Engineer will repeat the inspection when requested and when assured that the Work has been substantially completed. The Architect/Engineer will perform one re-inspection as indicated. If additional re-inspections are required, the contractor will be back charged by the Owner for the Architect/Engineering fees associated with this work.

b. Results of the completed inspection will form the initial "punch list" for final acceptance.

1.4 PRE-REQUISITES TO FINAL ACCEPTANCE

A. General: Complete the following before requesting the Architect/Engineer's final inspection for certification of final acceptance, and final payment as required by the General Conditions. List known exceptions if any, in the request.

a. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

b. Submit an updated final statement, accounting for final additional changes to the Contract Sum.

c. Submit a certified copy of the Architect/Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been endorsed and completed or otherwise resolved for acceptance and has been endorsed and dated by the Architect/Engineer.

d. Submit final meter readings for utilities, a measured record of stored fuel, and similar data either as of the date of substantial completion, or else when the Owner took possession of and responsibility for corresponding elements of the Work.

e. Submit consent of surety. Submit a final liquidated damages settlement statement, acceptable to the Owner.

f. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Re-inspection Procedure: The Architect/Engineer will re-inspect the Work upon receipt of the Contractor's notice that the work, including punch-list items resulting from earlier inspections, has been completed, except for those items whose completion has been delayed because of circumstances that are acceptable to the Architect/Engineer.
   a. Upon completion of re-inspection, the Architect/Engineer will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.
   b. If necessary, the re-inspection will be repeated. The Architect/Engineer will perform one re-inspection as indicated. If additional re-inspections are required, the contractor will be back charged by the Owner for the Architect/Engineering fees associated with this work.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in the various "submittals" sections.
   a. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect/Engineer's reference during normal working hours.

B. Record Drawings: Maintain a record set of blue or black line whiteprints of contract drawings and shop drawings in a clean, undamaged condition. Mark-up the set of record documents to show the actual installation where the installed work varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are sued for mark-up; record a cross-reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.
   a. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.

b. Mark-up new information, which is known to be important to the Owner, but for some reason was not shown on either contract drawings or shop drawings.
c. Note related change-order numbers where applicable.
d. Organize record drawing sheets into manageable sets, bind with durable paper cover sheet, and print suitable titles, dates and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including specifications and addenda, and one copy of other written construction documents such as change orders and similar modifications issued in printed form during construction. Mark these documents to show substantial variations in the actual work performed in comparison with the text of the specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable.
   a. Upon completion of the Work, submit record specifications to the Architect/Engineer for the Owner's records.

D. Record Sample Submitted: Immediately prior the date or dates of substantial completion, the Contractor will meet at the site with the Architect/Engineer and the Owner's personnel, if desired, to determine which, if any, of the submitted samples that have been maintained by the Contractor during progress of the Work, are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's sample storage area.

E. Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with the actual performance of the Work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continue use and reference. Submit to the Architect/Engineer for the Owner's records.

F. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind data into individual binders properly identified and indexed. Bind each set of data in a heavy-duty 2-inch, 3-ring vinyl-covered binder, with pocket folders for folded sheet

information. Mark the appropriate identification on both front and spine of each binder. Submit two (2) copies.

G. Include the following types of information in operation and maintenance manuals:
   a. Emergency Instructions
   b. Spare parts listing
   c. Copies of warranties
   d. Wiring diagrams
   e. Recommended “turn-around” cycles
   f. Inspection procedures
   g. Shop drawings and product data
   h. List of paint colors, paint codes, and address of where purchased.
   i. Keys to toilet accessories, electrical panels, etc.
   j. List of bulb and ballast replacement parts for each type of light fixture.

H. Project Records: Organize the following items into three ring binders separately for each of the items below:
   a. Contractor’s daily field reports
   b. Meeting minutes
   c. All test reports
   d. Building Departments inspection sheets, notes. Letters and permit documentation.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLOSEOUT PROCEDURES

A. General Operating and Maintenance Instructions: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner’s personnel to provide necessary basic instruction in the proper operation and maintenance of the entire Work. Where installers are not experienced in the required procedures, include instruction by the manufacturer’s representatives.

B. As part of this instruction provide a detailed review of the following items:
   a. Maintenance manuals.
   b. Record documents
   c. Spare parts and materials
   d. Tools
   e. Lubricants

f. Fuels
g. Identification systems
h. Control Sequences
i. Hazards
j. Cleaning
k. Warranties, bonds, maintenance agreements and similar continuing commitments.

C. As part of this instruction for operating equipment demonstrate the following procedures:
a. Start-up
b. Shut-down
c. Emergency operations
d. Noise and vibration adjustments
e. Safety procedures
f. Economy and efficiency adjustments
g. effective energy utilization

3.2 FINAL CLEANING

A. General: Special cleaning requirements for specific units of Work are included in the appropriate sections of Divisions 2 through 16. General Cleaning during the regular progress of the Work is required by the General Conditions and is included under section “Temporary Facilities”.

B. Cleaning: Provide final cleaning of the Work at the time indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturers instructions for operations.

C. Complete the following cleaning operations before requesting the Architect/Engineer’s inspection for certification of substantial completion.
a. Remove labels which are not required as permanent labels.
b. Clean transparent materials, including mirrors and glass in doors and windows, to a polished condition. Remove putty and other substances which are noticeable as vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

c. Clean exposed exterior and interim hard-surfased finishes to a dust-free condition, free of dust, stains, films and similar noticeable distracting substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

d. Wipe surfaces of mechanical and electrical equipment clean. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

e. Clean the project site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas to a broom clean condition; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

D. Pest Control: Engage an experienced exterminator to make a final inspection of the project, and to rid the project of rodents, insects, and other pests.

E. Removal of Protection: Except as otherwise indicated or requested by the Architect/Engineer, remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work during the remainder of the construction period.

F. Compliance: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

a. Where extra materials of value remaining after completion of associated work have become the Owner's property, dispose of these materials to the Owner's best advantage as directed.

END OF SECTION

SECTION 01 71 00

CLEANING UP

1. GENERAL

During its progress the work and the adjacent areas affected thereby shall be kept cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owner representatives will be inconvenienced as little as possible.

Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.

On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.

The Contractor shall thoroughly clean all materials and equipment installed by him and his subcontractors, and on completion of the work shall deliver it undamaged and in fresh and new-appearing condition. All mechanical equipment shall be left fully charged with lubricant and ready for operation.

The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner representative's personnel.
6. Final cleaning.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 1 Section "Construction Photographs" for submitting Final Completion construction photographs and negatives.
3. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
4. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner representative of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner representative unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner representative. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner representative. Advise Owner representative's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner representative of changeover in heat and other utilities.
12. Submit changeover information related to Owner representative's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's and SHPO Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner representative's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and owners representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access

to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

    a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
    b. Accurately record information in an understandable drawing technique.
    c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
    d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Note related Change Orders, Record Drawings, and Product Data, where applicable.

D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.

E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

    a. Emergency instructions and procedures.
    b. System, subsystem, and equipment descriptions, including operating standards.
    c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
    d. Description of controls and sequence of operations.
    e. Piping diagrams.

2. Maintenance Data:

    a. Manufacturer's information, including list of spare parts.
    b. Name, address, and telephone number of Installer or supplier.
    c. Maintenance procedures.
    d. Maintenance and service schedules for preventive and routine maintenance.
    e. Maintenance record forms.
    f. Sources of spare parts and maintenance materials.
    g. Copies of maintenance service agreements.
    h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf

binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner representative during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner representative's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Develop a training with Owner, through Architect, with at least seven days' notice.

1. Provide instructors experienced in operation and maintenance procedures. Incorporate nontoxic cleaning methods and sustainable maintenance.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner representative, through Architect, with at least seven days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.
2. Review of documentation.
3. Operations.
4. Adjustments.
5. Troubleshooting.
6. Maintenance.
7. Repair.
8. Recycling.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and anti-pollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

        1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

    m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    n. Replace parts subject to unusual operating conditions.
    o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Comply with safety and environmental standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner representative's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully. Use non-toxic and low-VOC cleaning products to the extent possible while complying with manufacturer's recommendations.

END OF SECTION

SECTION 01 78 10

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:
1. Division 1 Section "Closeout Procedures" for general closeout procedures.
2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 2 through 16 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up Record Prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal: Submit one set of plots from corrected Record CAD Drawings and one set of marked-up Record Prints. Architect will initial and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return plots and prints for organizing into sets, printing, binding, and final submittal.
b. Final Submittal: Submit one set of marked-up Record Prints. Print each Drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.

2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
3. Note related Change Orders and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01 78 10

DIVISION 2 – SITE WORK

SECTION 02 20 00
EARTHWORK

1.0 GENERAL

1.1 Scope of the Work:

The work under this section includes furnishing the materials, machinery, equipment, and labor necessary to perform all excavation, fill and backfill required for the entire project.

1.2 Related Work Specified Elsewhere:

Section 02010 - Subsurface Conditions
Section 02100 - Clearing and Grubbing
Section 02668 - Water Service Piping
Section 02730 - Sanitary Sewer System
Section 02720 - Storm Sewer System

1.3 Quality Assurance:

1.3.1 Testing Agency

In Place soil compaction tests to be performed by testing laboratory employed by Contractor. Test on material for controlled fill shall be performed by testing laboratory employed by Contractor and approved by Owner. For earthwork recommendations the Contractor shall consult with a Geotechnical Engineer.

1.3.2 Applicable Publications:

The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of these specifications to the extent indicated by references thereto:

a) American Society for Testing and Materials (ASTM)

C136 Test for Sieve Analysis of Fine and Coarse aggregates

D423 Test for Liquid Limit of Soils

D424 Test for Plastic Limit and Plasticity Index of Soils

D698 Moisture - Density Relationship of Soils. Using 5.5. lb. (2.5kg) Rammer and 12-in.] (304.8mm) Drop.

D1140 Amount of Material in Soils Finer than the No. 200 Sieve

D1557 Moisture - Density Relations of Soils. Using 10 lb. (4.5kg) Rammer and 18-in (457mm) Drop.

D2167 Density of Soil in Place by the Rubber Balloon Method.

D2487 Classification of Soils for Engineering Purpose.

D2922 Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth).

D2937 Density of Soil in Place by the Drive-Cylinder Method.

1.3.3 General

a. Slopes

Fill slopes shall not be steeper than two (2) horizontal to one (1) vertical, except when indicated on the recommendations given by the geotechnical engineer responsible for the project's sub-soil exploration report. Protection of slopes by planting of grass and shrubs on same shall be performed immediately upon their completion.

Cut slopes may vary as follows:

1. Alluvium Residual Soils-2H:IV

2. Weathered Rock

-No higher than 8 m in vertical rise------1H:IV

-Higher than 8 m in vertical rise------1.5H:IV

b. Satisfactory Soil Materials

Comply with the American Association of State Highway Officials (AASHO) Designation M145, soil classification Groups A-2-4 or better.

No stones over four (4) inches in diameter shall be placed within structure construction. Stones in earthfill shall be well distributed outside building areas.

c. Unsatisfactory Soil Materials

Includes soil classification Groups not mentioned above, also peat and other highly organic soils; and soil materials that have moisture content at the time of compaction beyond the range of 1% below and 3% above the optimum moisture content of the soil material, as determined by moisture-density relations test.

d. Site Information

1. The data on subsurface conditions reports are not intended as representations of warranties of the continuity of such conditions. The Owner will not be responsible for interpretations drawn there from by the Contractor.

2. Additional test borings may be made by the Contractor at no additional cost or time to the Owner.

e. Existing Utilities

1. Locate existing underground utilities indicated to remain in place by careful hand excavation before starting earthwork operations and provide protection from damage during construction operations.
2. Should uncharted or incorrectly charted utilities be encountered during excavation, consult the Owner immediately for directions as to procedure. Repair damaged utilities to the satisfaction of the utility owner.

3. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writhing by the Owner.

1.3 Submittals

1.3.1 Certified Laboratory Test Reports

Submit two (2) copies of the following reports directly to the Owner from the testing services.

a. Test reports on borrow material.

b. Field density test reports.

c. One optimum moisture-maximum density curve for each type of soil encountered.

d. Report of actual unconfined compressive strength and/or results of place bearing tests of each strata tested.

e. Other tests and materials certificates as required.

1.4 Sampling and Testing

Provide soil testing service for quality control testing during earthwork operations subject to acceptance by the Owner.

1.4.1 Test for Proposed Soil Materials

a. Submit test reports on the same day tests are conducted to the Owner, for tests herein specified and for additional test that may be required.

b. Provide one optimum moisture-maximum density curve for each type of soil encountered in subgrade and fills. Determine maximum densities in accordance with ASTM D 1557.

c. For borrow materials, perform a mechanical analysis (AASHO T88), plasticity Index (AASHO T91), moisture-density curve (AASHO T 180 or ASTM D 1557).

d. The testing service will determine the suitability of all materials to be used as fills.

1.4.2 Quality Control Testing During Construction

a. Testing service must inspect and approve all subgrades and fill layers before construction work is performed thereon. Test of the subgrades and fill layers will be taken as follow:

1. <u>Footing Subgrade</u>

For each strata of soil on which footing will be placed, conduct at least one plate bearing test and field density test if subgrade is cohesionless, or an unconfined compression test if subgrade is cohesive, to verity the design bearing capacities shown on the drawings. Subsequent verification and approval of each footing subgrade may be based on visual comparison of each subgrade with the related tested strata, when acceptable to the Owner.

2. <u>Paved Areas and Building Slab Subgrade</u>

Make at least one field density test of the subgrade for every 2,000 sq. ft.

of paved area of building slab, but in no case less than three (3) tests. In each compacted fill layer, make one field density test for every 250 sq. ft. of overlaying building slab or paved area, but in no case less than three (3) tests.

3. Foundations Wall Backfill

Take at least two (2) field density tests, at locations and elevations as directed.

b. If, in the opinion of the Owner, based on reports of the testing service and inspection, the subgrade or fills which have been placed are below the specified density, the Owner will require additional compaction and testing at the expense of the Contractor.

c. The results of density tests of soil-in place will be considered satisfactory if the average of any four (4) consecutive density tests which may be selected are in each instance equal to or greater than the specified density, and if not more than one (1) density test out of five (5) has a value of more than 2% below the required density.

1.5 Delivery and Storage

1.5.1 Materials shall be delivered and stored in a manner to prevent contamination and segregation.

1.6 Job Conditions

1.6.1 Erect sheeting shoring, and bracing as necessary for protection of persons, improvements and excavations. Provide dewatering and drainage as required to accomplish work of this section.

1.6.2 Use all means necessary to prevent the spread of dust on an near the site and off site areas during performance of the work, thoroughly moisture all surface as required to prevent dust being a nuisance to the public, neighbors, etc.

Use all means necessary to protect all materials of this section before, during, and after installation. Take the necessary precaution impreventing failure of street or sidewalk during excavation near those places. In the event of damage, make all repairs and replacement necessary at no additional cost to the Owner.

2.0 PRODUCTS

2.1 Material for Controlled Fill

2.1.1 Material for fill shall be approved by the Geotechnical Engineer. The criteria for acceptance shall be based on tests made for liquid and plastic limits, sieve analysis, maximum density at optimum moisture, shearing strength and expansive qualities. Potential volume change tests shall accompany field density tests results as required by field conditions. Proctor curve for use in control of full compaction shall include swell characteristics obtained by Potential Volume Change tests, or other approved method.

2.1.2 Concrete floor slabs shall consist of clean crushed stone, crushed gravel, or uncrushed gravel, (90-100 percent passing a 3/4 inch sieve and 0-5 sand equivalent of not less than

50) (100% passing a ½" sieve and none passing a No. 50 sieve). Provide a 4" thick drainage fill unless otherwise shown on drawings.

2.1.3 Fill for subsurface drains shall consist of clean stone or gravel and shall conform to the following requirements:

a. Fill for perforated wall pipe shall meet the requirements of Type 1 material (indicated below).

b. Fill for open pipe shall consist of combination of Type 1 and Type II material indicated below and shall be placed as the pipe is laid.

Sieve Size	Type I Percent Passing	Type II Percent Passing
1-1/2"	- - -	100
1"	- - -	90 - 100
3/8"	100	25 - 60
No. 4	95 - 100	5 - 40
No. 8	- - -	- - -
No. 16	45 - 80	- - -
No. 50	10 - 30	- - -
No. 100	0 - 10	- - -

2.2 Soil Materials

2.2.1 Soil materials used as backfill for trenches shall consist of native materials which are free from debris, roots, wood, scrap materials and other vegetable matter and refuse.

2.2.2 Topsoil which is to be stripped and stockpiled shall be free of subsoil, refuse, stumps, rocks over one inch, brush, weeds and other materials detrimental to plan growth.

3.0 EXECUTION

3.1 Inspection

3.1.1 Verify that preceding work affecting work of this section has been satisfactory completed. Correct conditions adversely affecting work of this section.

3.1.2 Approval of Fill: No filling is to be under- taken unless and until the topsoil, as described in paragraph 3.4, has been thoroughly stripped. Subsequent to stripping the natural ground surface shall be proof rolled with a heavy roller or rubber tired vehicle to detect soft spots which shall be removed. Fill material shall be free from stumps, trees, roots, sod, and muck of any other material detrimental for the construction intended. Prior to fill operations the site of fill and borrow shall be inspected by the Soils Engineer. Approval for fill operations shall be granted in writing by the Soil Engineer, both for the entire project or for specific areas within the project.

3.2 Removal of unsuitable materials

Removal unsuitable material from within the limits of the work specified in this Section. Stockpile materials meeting requirements for controlled fill.

3.3 Clearing

All trees, logs, shrubs, and brush within the indicated clearing limits shall be removed except as indicated otherwise. Trees and shrubs which are not to be cut shall be protected properly from damage. Stump shall be removed entirely. Roots and matted roots shall be quibbled out at least 18 inches below the existing surface.

3.4 Topsoil

By topsoil is meant the thickness of soil from the existing unaltered ground surface, where vegetation grows, down to the depth when the last piece of root is encountered. When soft, expansive and/or organic subsoil is present, then all such subsoil shall be considered as topsoil for stripping purpose, unless otherwise indicated. Existing topsoil shall be stripped to a depth of four (4) inches, stockpiled separately from other excavated materials and shall be reused for finished surface grading. Topsoil shall be free of stones, wood matter, cuttings, excessive quantities of vegetation, and debris of every kind. Piles of topsoil shall be located so that material can be reused readily for finished surface grading; topsoil shall be protected and maintained until needed. The top four (4) inch thickness of all newly graded earth surfaced areas shall consist of topsoil.

3.5 Excavations

Excavations shall be carried to the contours and dimensions indicated or necessary and shall be kept free from water while construction therein is in progress. The additional cost of work due to excavation below the depths shown on drawings as authorized or directed by the Owner will be paid in accordance with the extra work provisions of the Contract. Soil distributed and weakened by the Contractor's operations, or soil permitted to soften from exposure to weather shall be excavated and replaced with granular material compacted 95% of ASTM (D698) (D1557) density. All additional work of this nature shall be at the Contractor's expense.

3.5.1 Excavation for Structures

Extended excavations a sufficient distance from footings and foundations to permit placing and removal and concrete formwork, installation of services, and for other construction required, and for inspection.

In the event that rock outcrops at the footing excavations, these shall be anchored into it for a minimum depth of four (4) inches. In the bottom, two (2) inches a sand cushion shall be provided to event out loads on the foundations.

A minimum of 1.5 ft. shall be provided in the event rock is found to outcrop at ground surface, and the sand cushion provided in the lower two (2) inches.

3.5.2 Excavation of Pipe Trenches

Excavation shall be to grade as set forth in AWWA C600, unless otherwise directed in the event of poor soil or excavation in rock. Width of trench shall be as required. Compaction of soil in the backfilling operation shall be as specified herein when piping with coal tar enamel coating is involved, backfilling shall also be in accordance with the applicable requirements of AWWA C203.

3.5.3 Excavation for Embankments and Under New Pavements and Concrete Slabs

The original ground under embankments less than four (4) feet in thickness and under new pavements and concrete slabs shall be excavated to remove vegetable, matter, sod, topsoil, muck, and rubbish to a minimum depth of six (6) inches and to remove any weak soil distributed by the Contractor's operations or softened by exposure to the elements and water. In the event that the Contractor is directed by the Owner to remove such suitable material to a greater depth than specified, an adjustment in the contract price or time for completion, or both, will be made in accordance with the contract. On slopes, the areas under the embankment shall be scarified after removal of such unsuitable material, and the first layer of embankment fill shall be keyed by scarifying securely to the existing

material.

3.5.4 Removal of Unsatisfactory Soil Materials

Excavate unsatisfactory soil materials not previously indicated that extend below the required elevations, to the additional depth directed by the Owner. Such additional excavation will be paid for by the Owner as a change in the work.

3.5.5 Removal of Existing Underground Utilities

Demolish and completely remove from the site all existing underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.

3.5.6 Shoring and Sheeting

Excavation shall be shored and sheeted with members of sizes and arrangement sufficient to prevent injury to persons, damage to structure, injurious caving during the removal of the shoring and/or sheeting. Comply with codes and authorities having jurisdiction.

3.6 Borrow Materials

The borrow pits shall be graded uniformly with the edges trimmed neatly and shall be drained properly. All borrow materials shall be taken to a soils laboratory for testing and approval prior to their use at the project.

3.7 Filling and Backfilling

3.7.1 Backfilling for Structures shall be placed in layers not more than 6" thick, and each layer shall be compacted to at least 90% of ASTM (D698) (D1557) density (Modified proctor Method). Backfill adjacent structural elements shall be placed, as far as practicable, as the adjacent structural elements have been completed and accepted. Backfilling of trenches shall progress as rapidly as the construction, testing and acceptable of the work permits. Except as specified otherwise elsewhere in this specification, in backfilling pipe trenches, fill shall be compacted in six (6) inch layers to a depth of one foot over the top of the pipe; the remainder of the trench shall be backfilled and compacted as specified under compaction.

For trenches excavated in roads and streets, the backfill shall be placed and compacted in six (6) inch layers at the top of the trench.

3.7.2 Fill for embankments, under spread footings, and for concrete slabs on grade which are not pile supported shall be placed in lifts no greater that six (6) inches and each lift shall be compacted as specified herein, before the overlaying lift is placed. In all areas not accessible to rollers or compactors, the fill shall be compacted with mechanical hand tampers. If the mixture is excessively moistened by rain, it shall be aerated by means of blade graders, or harrows until the moisture content to the mixture is satisfactory. The surface of the layer shall be finished by blanding or rolling with a smooth roller, or a combination thereof, and shall be smooth and free from waves and inequalities.

At deeply filled sectors a delay in the construction of the structures and tennis courts, after the fill is completed shall be allowed. A period of three months shall be provided at sectors having more than 2.5 mts. in fill thickness, to permit readjustment of the soil particles due to weight of the fill itself and percolating water.

All undesirable materials from the gully sector of the tract of land shall be removed under

the direct supervision of a geotechnical engineer. Once undesirable material is removed in its entirely, the exposed soil shall be proof rolled, and compacted to not less than 90% of the material's maximum dry density. (Modified Proctor Compaction).

To reduce differential settlement effects at cut and fill sectors lying inside the perimeter of any structure, the difference in fill thickness inside each unit shall not exceed 3 ft. That is, an over cutting of the structure area shall be allowed to accommodate equal fill thickness beneath the complete structure unit.

3.7.3 Capillary Water Barrier shall be placed directly on the subgrade. The barrier shall be constructed in layers not exceeding four (4) inches in compacted thickness, and each layer shall be placed with a minimum of two (2) passes of a hand operated plate type vibratory compactor.

3.7.4 Fill or perforated wall pipe shall be placed as the pipe is laid, and shall extend for a minimum of one pipe diameter each side of and 18 inches above the pipe.

3.8 Compaction

3.8.1 The subgrade of soil in cut shall have a density of at least 90 percent of the maximum density in accordance with the requirements of ASTM (D698) (D1557) to a depth of 12 inches below the subgrade surface. If the density of the exiting material is less than 90 percent, it shall be compacted to a depth of 12 inches to the minimum 90 percent density. Fill, embankment, and/or backfill under concrete floor slabs shall be compacted to not less than 90 percent of the maximum density; other backfill adjacent to and not supporting any structural elements to at least 90 percent. The upper 12 inches under paved areas. Shall be compacted to not less than 95% of the maximum density. The upper 12 inches of trenches shall be compacted to at least 90 percent of ASTM D698.

3.8.2 Compaction Equipment

Provide compaction equipment of suitable size and number, and in satisfactory working condition to complete the work on schedule.

A satisfactory balance between earthmoving equipment and soil compaction equipment shall be present at all times. Compaction equipment shall include sheepsfoot rollers or approved equivalent, permanently working. A steel roller form eight (8) to ten (10) to weight should be used for sealing of working surfaces in protection against ponding of surface water during rain showers. Earthmoving equipment must not be considered, under any circumstances, as compaction equipment, but its operation shall be distributed to avoid rutting and unequal compaction by its movement throughout the site.

3.8.3 Moisture Control

Maintain the actual moisture content in the soil material at the time of compaction to within the limits specified for unsatisfactory soil materials.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified percentage of maximum density.

3.8.4 Slope Control

Embankment slopes steeper than 1.5:1 (H:V) inclusive shall be protected from runoff and erosion by an appropriated type of vegetation cover. This may be performed by hydromulching in such a way as to cover the soil as fast as possible until evidence of

"catch" or uniform stand to prevent erosion is achieved, at which time final acceptance will be give. The contractor shall properly water, mow, and otherwise maintain all treated areas until final acceptance.

Damage resulting from erosion, gulleys, washouts or other causes shall be repaired by refilling, tamping, and resoding, reseeding or replacing.

3.9 Grading

3.9.1 General

Uniformly grade all areas within the limits of site grading. Smooth the finished surface with the specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

The degree of finish required will be that ordinarily obtainable from either bladegrader or scraper operations.

3.9.2 Grading Outside Building Lines

Hand-grade areas outside the building lines for each structures to drain away from the structure and to prevent ponding of water. Finish the surfaces free from irregular surface changes.

3.9.3 Grassed Areas

Finish areas to receive topsoil to within not more than 4" above or below the required subgrade elevations, and free from irregular surface changes.

3.9.4 Walks

Shape the surface of areas under walks to line, grade and cross-section, with the finish surface not more than 0.00 above or 4" below the required subgrade elevations, and graded to prevent ponding of water after rains.

3.9.5 Pavements

Shape the surface under pavement to line, grade and cross section, with the finish surface not more than ½" above or below the required subgrade elevation, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide the optimum moisture content for compaction.

Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material.

Where pavements area located in natural subsoil or where they are to be above less than 1-ft. of fill, the topsoil stripped surface shall be scarified and recompacted 12 inches into natural ground to at least 95% of the Modified Proctor Maximum Density.

3.9.6 Grading Surface of Fill Under Building Slabs

Grade the surface of fill under building slabs smooth and eve, free of voids, and to required elevation. Provide final grades within a tolerances of ¼" when tested with a 10' straight-edged.

3.9.7 Compacting

After grading, compact subgrade surfaces to the depth and percentage of maximum

density shown below:

a. Under Pavements	-	95% of Modified Proctor Maximum Density
b. Under Other Structures	-	90% of Modified Proctor Maximum Density
c. In Green Areas	-	90% of Modified Proctor Maximum Density

These minimum percent compactions should be attained while within the moisture content range shown on the compaction curve. The inplace dry density of the compacted fill shall be determined by methods specified under ASTM D-1556 of D-2922 (nuclear gauge).. At least one in-place moisture density determination shall be made for each 250.0 Sq. Ft. At least one laboratory compaction curve shall be performed for each distinctive type of material to be used in the fill.

3.10 Dewatering

3.10.1 The Contractor shall furnish, install, operate, maintain and remove pumps, well points, pipe lines, flumes, or other appliances and provide all labor and materials required to prevent interference with the work by water, irrespective of any depths to which the excavation is ordered to be carried, so that all work may be done in the dry. Temporary drainage ditches excavated by the Contractor for his conveniences in disposing of water, if approved by the Owner, shall be backfilled at the Contractor's expense.

3.10.2 Equipment and methods at Contractor's option subject to approval does not relieve Contractor form responsibility. All damage of any class of kind shall be made good at Contractor's expense.

Dispose of water in such manner as not to impair public health, or cause damage to persons or property, work completed or in progress.

3.10.3 All excavation, construction and backfilling shall be performed under workably dry conditions. Prior to any excavation below ground water level the dewatering system shall be installed and placed into operation in order to lower the water levels at least three (3) feet below the bottom and side slopes of the excavation. In the event of layered soils the hydrostatic head in previous zones below the subgrade elevation shall be relieved in order to prevent uplift.

3.10.4 Dewatering Performance

Performance of the dewatering system shall be measured by suitable observation wells or piezo meters installed in conjunction with the dewatering system and these are to be read at least daily. The Contractor shall maintain a log of these reading and submit them to the Owner.

3.11 Field Quality Control

3.11.1 Sampling

All sampling shall be conducted by the Contractor at his expense. A 50 lb. sample of granular fill shall be taken from capillary water barrier (drain rock) at least once daily for sieve analysis of aggregate.

3.11.2 Sample Identification

Each sample shall be contained in a clean container which shall be securely fastened to prevent loss of material. Each sample shall be tagged for identification. The tag shall contain the following information:

Contract No.
Sample No.
Date of Sample
Sampler
Source
Intended Use
For Testing

3.11.3 Testing

All testing shall be conducted by the Soils Consultant as specified herein at the expense of the Contractor.

3.12 Maintenance

3.12.1 Protection of Graded Areas

Protect newly graded areas from traffic and erosion, and keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to the specific tolerances.

3.12.2 Reconditioning Compacted Areas

Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction. Use hand tamping for recompaction over underground utilities, if any.

3.13 Removal of Debris

Upon completion of the work of this section, immediately remove all debris and excess earth materials from the site, leaving it in a neat condition.

*****END OF SECTION 02 20 00*****

SECTION 02 21 01
EARTH EXCAVATION, BACKFILL, FILL AND GRADING

PART 1 - GENERAL

1.01 DESCRIPTION:

Make excavation of normal depth in earth for trenches and structures; backfill such excavations; furnish necessary material and construct embankments and fills; make miscellaneous earth excavations and miscellaneous grading.

1.02 QUALITY ASSURANCE:

A. Wherever a percentage of compaction is indicated or specified, use percent of maximum density at optimum moisture as determined by Method D of ASTM Standard and Soil Aggregate Mixture Using 10-1B. (4.54 kg). Hammer and 10-in. (457mm) Drop, Designation D1557-78 and/or AASHTO T 180-90.

B. Length of trench open at any one time will be controlled by conditions and subject to any limits that may be prescribed by the Owner's Representative.

C. The Owner's Representative may require that pavement be cut with pneumatic tools, without extra compensation to Contractor, where in the opinion of the Engineer it is necessary in order to prevent damages to the remaining road surface. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.

D. Installation of well point and pump done shall be under supervision of a competent representative of the Contractor.

E. There may be pipes, drains, and other utilities in certain locations not indicated on drawings; no attempt has been made to show all services, and completeness or accuracy of information given is not guaranteed.

F. All existing pipes, poles, wires, fences, curbing, property line markers, and other structures that the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the Contractor. Should such items be damaged, they shall be restored by the Contractor, without compensation, to at least as good condition as that in which they were found immediately before the work was begun.

G. Whenever the Contractor encounters certain existing structures as described below and is so ordered in writing, he shall do the whole or such portions of the work as he may be directed to change the location of, remove and later restore, or replace such structures, or to assist the Owner thereof in so doing. For all such work the Contractor shall be paid under such items of work as may be applicable, otherwise as Extra Work.

H. In removing existing pipes or other structures, the Owner's Representative shall include for payment only those new materials which, in his judgment, are necessary to replace those unavoidably damaged.

I. The structures to which the provisions of the preceding two paragraphs shall apply include pipes, wires, and other structures which meet all the following: (a) are not

indicated on the drawings or otherwise provided for, (b) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (c) in the opinion of the Owner's Representative will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

J. Branches, limbs and roots shall not be cut except by permission of the Owner's Representative.

K. Restoration of existing property or structures done as promptly as practicable and not left until the end of the construction period.

L. If material unsuitable for foundation (in the opinion of the Owner's Representative) is found at or below the grade to which excavation would normally be carried in accordance with the drawings and/or specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, screened gravel, select bank-run gravel, fine aggregate or concrete as directed.

M. No excavation materials shall be removed from the site of the work or disposed of by the Contractor except as directed or permitted.

N. Surplus excavated materials not needed as specified above shall be hauled away and dumped by the Contractor, at his expense, at appropriate locations, and in a legal manner.

O. During progress of work, Contractor shall conduct his operations and maintain area of these activities, including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust.

P. In general, and unless other material is indicated on drawings or specified, material used for backfilling trenches and excavation around structures shall be suitable material which was removed in the course of making the construction excavations. If sufficient suitable material is not available from the excavations, the backfill material shall be screened gravel, bank-run gravel or selected borrow as directed.

Q. The nature of materials will govern both their acceptability for backfill and methods best suited for their placement and compaction in backfill.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material whether from excavation or from borrow, after being placed and properly compacted, shall make a dense stable fill containing no vegetation, masses of roots, individual roots more than 18 in. long or more than ½" in diameter, stones over 6 in.

B. Wellpoints shall be designed especially to drain soil and prevent saturated soil from flowing into excavation.

C. Pumping unit shall be designed for use with wellpoints and capable of maintaining high vacuum and handling large volumes of air and water at the same time.

D. Use Class B concrete, screened gravel, select bank-run gravel, fine aggregate, selected borrow.

E. Select bank-run gravel shall contain not more than 10 percent material passing a 200 sieve.

PART 3 - EXECUTION

3.01 DESCRIPTION:

A. Carry out program of excavation, dewatering, sheeting, and bracing in such manner as to eliminate all possibility of undermining or disturbing foundation of existing structures or of work previously completed under this contract.

B. Excavate to widths that give suitable room for building structures or laying and jointing piping; furnish and place all sheeting, bracing, and supports; do all cofferdamming, pumping, and draining; and render bottom of excavations firm and dry and acceptable in all respects.

C. Do not plow, scrape or dig by machinery, earth near to finished subgrade so as to result in disturbances of material below subgrade, unless indicated or specified, and remove with pick and shovel, material to be excavated, just before placing pipe, masonry or other structure.

D. Make all excavation in open, except as otherwise specified or permitted.

3.02 SEPARATION OF SURFACE MATERIALS:

A. Remove only such parts of existing pavement that are necessary for prosecution of work.

B. Carefully remove loam and topsoil from excavated areas; store separately for further use or furnish equivalent loam and topsoil as directed.

3.03 DRAINAGE:

A. Provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations. Keep such excavations dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.

B. Dispose of all pumped or drained water without undue interference to other work, damage to pavements, other surfaces, or property. Provide suitable temporary pipes, flumes, or channels for water that may flow along or across the site of work.

1. Temporary Underdrains: Lay temporary underdrains, when used, in trenches beneath grade of structure. Provide trenches to accommodate underdrain and surrounding gravel. Lay underdrains at suitable distance below bottom of normal excavation with open joints wrapped in cheesecloth, and entirely surrounded by graded gravel or crushed stone to prevent the admission of sand or other soil into the underdrains. Distance between bottom of pipe at least 3 in. unless otherwise permitted. Space between underdrain and pipe or structure shall be filled with screened gravel of crushed stone, rammed if necessary, and left with a surface suitable for laying pipe or building structure.

2. Drainage Wellpoint System: Dewater excavation, if necessary, by an efficient drainage wellpoint system that will drain soil and prevent saturated soil from flowing into excavation. Provide special work such as surrounding wellpoint

with sand or gravel or other work necessary for wellpoint system to operate for successful dewatering of excavation.

3.04 TRENCH EXCAVATION:

A. Excavate trench by machinery to, or just below designated subgrade, where pipe is to be laid in gravel bedding or concrete cradle, provided that material remaining at bottom of trench is only slightly disturbed.

B. Do not excavate lower part of trenches by machinery to subgrade, where pipe is to be laid directly on bottom of trench. Remove last of material to be excavated by use of hand tools, just before placing of pipe. Form a flat or shaped bottom, true to grade, so that pipe will have a uniform and continuous bearing. Support on firm and undisturbed material between joints, except for limited areas where use of pipe slings have disturbed bottom.

3.05 DEPTH OF TRENCH:

A. Excavate trenches to depths as to permit pipe to be laid at elevations, slopes or depths of cover indicated on Drawings, and at uniform slopes between indicated elevations.

3.06 WIDTH OF TRENCH:

A. Make pipe trenches as narrow as practicable, being careful not to widen them by scraping or loosening materials from the sides. Make every effort to leave deep sides of trenches firm and undisturbed until backfilling has been completed and consolidated.

B. Excavate trenches with approximately vertical sides between elevation of center of pipes and elevation 1 ft. above top of pipe.

3.07 TRENCH EXCAVATION FILL:

A. Place material to top of fill or to a minimum height of 1 ft. above the top of pipe, whichever is less, when pipe is to be laid in embankment or other recently filled material. Take particular care to ensure maximum consolidation of material under pipe locations. Excavate pipe trench as though in undisturbed material.

3.08 EXCAVATION NEAR EXISTING STRUCTURES:

A. Discontinue digging by machinery where excavation approaches pipes, conducts, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation, in work to be done, when incidental to normal excavation and under items involving normal excavation.

3.09 CARE AND RESTORATION OF PROPERTY:

A. Enclose uncut tree trunks adjacent to work in wooden boxes of such height as may be necessary for protection from injury from piled material, equipment, operations, or otherwise due to work. Excavation machinery and cranes shall be of suitable type, and operated with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.

B. All branch, limb, and root cuttings shall be made smoothly and neatly without splitting or crushing. Cut or injured portions shall be neatly trimmed and covered

with an application of grafting wax or tree healing paint as directed, when unavoidable injury or cutting to branches.

C. Protect cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations by suitable means or dug up and temporarily replanted and maintained. After construction operations have been substantially completed, replant in original positions and care for until growth is reestablished. If cultivated hedges, shrubs and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, replace by items equal of the kind and quality existing at the start to the work.

D. Do not use or operate tractors, bulldozers, or other power operated equipment on paved surfaces when treads or wheels of which are so shaped as to cut or otherwise injure such surfaces.

E. Restore all surfaces which have been injured by the Contractor's operations, to a condition at least equal to that in which they were found immediately before work commenced. Suitable materials and methods shall be used for such restoration.

3.10 UNAUTHORIZED EXCAVATION:

A. Backfill, when bottom of any excavation is taken out beyond limits indicated or prescribed and without additional compensation, with thoroughly compacted, screened gravel, if the excavation is for a pipelines, or with Class B concrete, if the excavation is for a masonry structures.

3.11 DISPOSAL OF SURPLUS EXCAVATED MATERIALS:

A. Use surplus excavated materials suitable for backfill to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill; deposit neatly and grade so as to make or widen fills; flatten side slopes, or fill depressions; or dispose of them legally.

3.12 FILL AND BACKFILL UNDER STRUCTURES:

A. Compact all fill and backfill under structures and pavements adjacent to structures with select bank-run gravel or coarse aggregate and fine aggregate when indicated.

B. Place fill and backfill materials in layers not exceeding 6 in. in thickness. Unless otherwise indicated or specified, each layer shall be compacted to 95 percent.

3.13 BACKFILLING PIPE TRENCHES:

A. Start backfilling and proceed until complete as soon as practicable after the pipes have been laid and the joints have acquired a suitable degree of hardness, if applicable, or structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected.

B. Do not backfill trenches at pipe joints until after section of pipeline has successfully passed any specified test required. Should Contractor wish to minimize maintenance of lights and barricades and obstruction of traffic, he may, at his own risk backfill the entire trench, omitting or including backfill at joints as soon as practicable after the joints have acquired a suitable degree of hardness, if applicable, and related structures have acquired a suitable degree of strength.

Remove and later replace such backfill, at own expense, in order to locate and repair or replace leaking or defective joints or pipe.

1. **Material**: Do not place stone or rock fragment large than 6 in. in backfill nor drop large masses of backfill material into trench in such a manner as to endanger the pipeline. See trench details on the Drawings. Exclude pieces of bituminous pavement from the backfill unless use is expressly permitted, in which case break as directed.

2. **Zone Around Pipe:** Backfill zone around the pipe with materials and limits indicated on drawings. Material shall be compacted to 90 percent of maximum density by tamping.

3. **Remainder of Trench:** Compact trench above zone around pipe, by water-jetting, puddling, or tamping, in accordance with nature of material and compaction requirements. Water-jetting or puddling may be used wherever the material does not contain so much clay or loam as to delay or prevent satisfactory drainage. However, use tamping if water-jetting or puddling does not compact material to density required.

4. **Water-jetting:**

    a. Compact material by water-jetting, if necessary, by placing jet pipes in trench and saturating throughout its full depth and at frequent intervals across and along trench until all slumping ceases. To accomplish this, furnish one or more jet pipes, each of sufficient diameter (not less than 1-1/4 in.) to supply an adequate flow of water to compact material. Equip jet pipe with a quick-acting valve, supplied through a fire hose from a hydrant or a pump having adequate pressure and capacity.

5. **Puddling:**

    a. Deposit water material of sufficient depth, if backfill is to be compacted by puddling, so that material will be submerged when in place.

    Compact, by tamping, dams or dikes constructed in trench to hold water used for puddling as specified below.

6. **Tamping:**

   a. Before compaction, deposit and spread material in uniform parallel layers not exceeding 8 in. thick when compacted by tamping or, under appropriate circumstances, rolling. Before next layer is placed, tamp each layer as required to obtain a thoroughly compacted mass. Take care that material close to bank, as well as in all other portions of trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed make it feasible, and it can be done effectively without damage to the pipe, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping (or rolling), rate at which backfilling material is deposited in trench shall not exceed that permitted by facilities for its spreading, with leveling, and compacting furnished by Contractor.

   b. Wet material by sprinkling when necessary to ensure proper compaction by tamping (or rolling). However, no compaction by tamping (or rolling) shall be done when material is too wet either from rain or too great an application of water to be compacted properly; at such times suspend work until previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions taken as may be necessary to obtain proper compaction.

*****END OF SECTION 02 21 01*****

SECTION 02 61 00
ASPHALTIC PAVEMENT

PART 1 - GENERAL

RELATED DOCUMENTS: Drawings and general provisions of Contract Documents, including General and Supplementary Conditions.

1.01 DESCRIPTION OF WORK:

A. Work Includes:

Asphaltic pavement required for this Work is indicated on the Drawings and includes:

1. Final preparation of subgrade.
2. Mineral aggregate base course.
3. Asphalt surfacing materials.
4. Parking lines, traffic lines and handicap symbols.
5. Car Stops

B. Type of Asphaltic Pavement:

Asphaltic pavement shall be Full Depth (Black Base) Bituminous Pavement type.

1.02 QUALITY ASSURANCE:

Provided personnel who is thoroughly trained and experienced in the skills required and who are familiar with the design and application of work described for this Section and who shall direct all work performed under this Section.

1.03 SUBMITTAL:

Submit a job mix formula indicating definite percentage of each sieve fraction, percentage of bitumen and temperature of mix as discharged from mixer.

1.04 PRODUCT HANDLING:

A. Use all means necessary to protect asphaltic concrete pavement materials before, during and after installation and to protect the installed work and materials of all other trades.

B. In the event of damage, immediately make all repair and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.05 DUST CONTROL:

Use all means necessary to prevent spread of dust during performance of the work of this Section. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of other work on the site.

PART 2 - PRODUCTS

2.01 ASPHALTIC PAVEMENT:

A. The following materials shall conform with the requirements of the American

Society for Testing and Materials (ASTM), as follows:

1. Mineral filler for bituminous paving mixtures shall conform to ASTM D-242.

2. Coarse aggregate for bituminous paving mixture shall conform to ASTM D-692.

3. Asphalt cement for use in pavement construction shall conform to ASTM D-946.

4. Fine aggregate for bituminous paving mixtures shall conform to ASTM D-1073.

5. Resistance to plastic flow of bituminous mixtures shall conform to ASTM D-1559.

6. Hot-mixed, hot-laid asphalt paving mixture shall conform to ASTM D-1663.

7. Coating and stripping of bitumen-aggregate mixtures shall conform to ASTM D-1664.

B. Mix composition for base course shall be Type IV-d and for surface course shall be Type IV-b, in accordance with Specifications 401 of the Puerto Rico Highway and Transportation Authority.

2.02 TRAFFIC PAINT:

Traffic paint for parking lines, traffic lines and symbols and handicap symbols shall be equal to Romark Crosswalk Paint as manufactured by Glidden Corporation conforming to Federal Specification TT-P-115; white, yellow, or blue (for handicap signs) color as directed.

2.03 CAR STOPS:

Car stops shall be precast 6'0" long, 6" high with two 3/4" diameter x 10" long anchor bolts as detailed on drawings.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS:

Prior to all work of this Section, inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that asphaltic pavement may be installed in strict accordance with the design and all pertinent codes, regulations and standards. In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 FINAL PREPARATION OF SUBGRADES:

A. After preparation of subgrades, thoroughly scarify and sprinkle the entire area to be paved and then compact by rolling to a smooth, hard, surface of 90% compaction to receive the base course.

B. Finish to the required grades with due allowance for the thickness of base course and finished surfacing to be placed thereon.

3.03 EQUIPMENT:

All equipment for compacting shall be self-propelled tandem rollers having a minimum weight of ten tons, except that hand-held vibrator compactors may be used in areas not accessible to rollers when approved by the Owner.

3.04 TRANSPORTATION:

A. Mixture shall be transported from the paving plant to the site in trucks having tight, clean, smooth beds. Each load shall be covered to protect it from the weather and to prevent the loss of heat.

B. Deliveries shall be made so that spreading and rolling of all the mixture prepared for a day's run can be completed during daylight.

C. The mixture shall be delivered to the area to be paved in such manner that the temperature at the time of dumping will not be less than 225 degrees Fahrenheit. Any load wet excessively by rain will be rejected.

3.05 PLACEMENT:

A. After completion of subgrade operations, place the specified base course to the thickness shown on Drawings.

B. Placing shall begin at center line of crowned sections and at high side of one-way slope section.

C. Spreading and rolling shall be as continuous as possible.

D. Joints shall present same texture, density and smoothness as other sections of the course. Joints in base course shall not coincide with joints in surface course.

E. After the base course is placed, compacted and approved the surface course shall be spread and rolled in a continuous operations.

3.06 COMPACTION:

A. Start rolling as soon as mixture will bear roller without undue displacement.

B. Compact from sides to center, overlapping by at least one-half the width of rear wheel on successive trips. Alternate trips shall be of slightly different lengths.

C. Any displacement of mixture shall be corrected at once by rakes or mixture removed and fresh mixture added as required.

D. In areas inaccessible to rollers the use of mechanical or hand tampers may be used.

E. Compaction shall continue until roller marks are eliminated, smooth and unyielding surface and true to the thickness and elevations shown on Drawings.

F. Trim all edges neatly.

3.07 TESTING AND SAMPLING:

A. All sampling and testing shall be performed by a well recognized laboratory

chosen by the Owner.

B. All sampling and testing shall be paid by the Contractor.

C. Samples of plant mixtures shall be taken and tested for each day's placing, unless otherwise directed.

D. Tests:

1. Smoothness tests shall be performed after rolling each course with a ten (10) foot straight edge. Irregularities greater than ¼" in ten feet in base course and 1/8" in ten feet in surface course, shall be corrected.

2. Test to determine gradation and bitumen content shall be performed on samples taken from the plant mixtures as required in paragraph 3.07-A above.

3. Tests to determine the thickness of base course and surface course shall be made by three (3) inches diameter test holes; at least one test for each 200 square yards or fraction of each course.

4. Compaction test to determine the density shall be made and shall be at least 96% of a laboratory specimen of the same mix when subjected to 50 blows each end to specimen in the Marshall mold.

3.08 TRAFFIC PAINT:

A. Thoroughly clean the surface area where traffic paint is to be applied following the paint manufacturer's recommendation.

B. Apply all traffic lines and signs on pavements, gutters, drive-ways, ramps, walks and parking areas as directed and as shown on Drawings.

C. All lines shall be at least 3" wide unless indicated otherwise, and shall be applied with stencils or making machines as approved.

D. The paint manufacturer's instructions shall be followed throughout the painting process.

3.09 CAR STOPS:

Car stops shall be provided at all parking spaces, and as indicated on drawings.

3.10 CLEANING:

A. Upon completion of each day's work all immediate adjacent areas shall be cleaned of all excess materials and dirt and all stain promptly removed.

B. Upon completion of all work of this Section, remove from the job site all excess materials, debris, mixture dropping and all tools and equipment leaving all areas in a neat and orderly condition to the approval of the Architect.

*****END TO SECTION 02 61 00*****

SECTION 02 62 00
CURBS, GUTTERS AND SIDEWALKS

1. GENERAL

1.1 Scope of Work

The work under this section includes furnishing all materials, machinery, equipment and labor necessary for the construction of all concrete curbs, gutters, and sidewalks as shown on drawings.

1.2 Quality Assurance

1.2.1 Requirements of Regulatory Agencies

Install curbs, gutters, and sidewalks to meet requirements of the Puerto Rico Highway and Transportation Authority and of the Public Works Department of Puerto Rico.

1.2.2 Applicable Publications

The following publications of the issues listed below but referred to thereafter by basic designation only, form a part of this specifications to the extent indicated by reference thereto:

a. The Asphalt Institute

1. SS-3, Specification Series No. 3, Specifications and Construction Method for Asphalt Curbs, Gutters, and Sidewalks .

b. American Society for Testing and Materials (ASTM)

1. C 94 Ready Mix Concrete
2. C 171 Sheet Materials for Curing Concrete
3. C 270 Mortar for Unit Masonry
4. C 309 Liquid Membrane – Forming Compound for Curing Concrete
5. C 568 Dimension Limestone
6. C 615 Structural Granite
7. C 616 Building Sandstone
8. D1190 Concrete Joint Sealer, Hot Poured Elastic Type
9. D1751 Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
10. D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.3 Submittals

1.3.1 Provide samples, manufacturer's data, test reports, and material certifications.

1.3.2 Test Reports

Reports of Portland Cement Concrete compression, yield, and air content test listed in ASTM C94. Reports of sampling and testing for asphalt paving mixtures

listed in ASTM C1663.

1.3.3 Certificates

Manufacturer's certification that products meet specification requirements.

1.4 Environmental Requirements

1.4.1 Portland Cement Concrete

Do not place concrete during rain or very hot weather (maximum concrete temperature 90°F (32°C)).

1.5 Protection

1.5.1 Protect Portland Cement Concrete from traffic for minimum of seven (7) days.

2. PRODUCTS

2.1 Material

2.1.1 Forms

Forms shall be steel only rigidly held in place with clamps, spreaders and/or braces. Owner's approval is required before concrete is place.

Forms shall be set true to line and grade and maintained so as to insure completed work within the allowable tolerance specified, and shall be mortar tight. The contractor shall be responsible for the adequacy of forms and form supports.

2.1.2 Expansion Joint Fillers

Expansion joint fillers shall be performed type conforming to ASTM-D-1751.

2.1.3 Joint Sealing Material

Joint sealing material shall conform to ASTM-D-1850 or SS-S-1401, except that all joints exposed to the weather shall be sealed with material conforming to SS-S-1410.

2.1.4 Cement

Cement shall be Type I conforming to ASTM-C-150.

2.1.5 Water

Water formixing and curing, including free moisture and water in the aggregate, shall be fresh, clean and portable. Turbidity of the water shall not exceed 2,000 parts per million.

2.1.6 Aggregate

Comply with the requirements of ASTM-C-33 and as herein specified.

Do not use aggregates containing soluble salts or other substances such as iron sulphides, pyrite, marcasite or ocher which can cause stains on exposed concrete surfaces.

Provide aggregate from a single source for all exposed aggregate finish and exposed architectural concrete.

Fine aggregate shall be clean, sharp, natural and free from loam, lumps or other deleterious substances.

Coarse aggregate shall be clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:

Crushed stone, processed from natural rock or stone.

Washed gravel, either natural or crushed with water that is clean, fresh and free of oil, acid, organic matter or other deleterious substances.

Maximum aggregate size 3/4" to be used, except as otherwise specified.

2.1.7 Admixtures

Chemical admixtures shall not be used without the written permission of the Owner. When more than one admixture is used in a mix, the Contractor shall furnish satisfactory evidence that the admixtures to be used are compatible in combination with the cement and aggregate to be used for the project and will be suitable at the job temperatures. Air-entraining admixtures conforming to ASTM-C-260 shall be used in all concrete specified to be air-entrained.

2.1.8 Concrete Curing Materials

Absorptive Cover

Provide absorptive cover for curing concrete consisting of burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd. and complying with AASTHO M 182, Class 3.

Moisture-Retaining Cover

Provide moisture retaining cover for curing concrete of any of the following:

Waterproof paper, complying with ASTM-C-171, Type 1 or Type 2.

Polyethylene sheeting, complying with AASHO M 171.

Polyethylene - coated burlap.

Membrane-Forming Curing Compound

Provide a liquid type membrane-forming curing compound complying with ASTM-C-309.

Use Type 1, clean with fugitive dye, for interior and exterior surfaces to receive applied finish.

2.1.9 Rubble Stone

a. Rubble stone shall be sound and free of structural defects and foreign substances with length and width of 6 to 8 inches and at thickness of 2 to 6 inches.

2.1.10 Bed Course Aggregate

Sand, gravel, crushed stone, or slag passing ½ in. square mesh sieve.

2.1.11 Ready-Mix Concrete

Ready-mixed concrete shall conform to ASTM-C-94 as modified herein. Ready-mixed concrete is defined in this specification as concrete produced regularly by a commercial establishment and delivered to the purchaser in the plastic state. Ready-mixed concrete may be used provided that:

a. The plant has sufficient capacity and transportation equipment to deliver the concrete at the rate desired, and

b. the plant meets the requirements for equipment, measurement of materials, and mixing, except as modified herein. The cement, aggregates, water and admixtures shall conform to all applicable requirements of this specification. Ready-mixed concrete not specified otherwise hereinafter shall be mixed and delivered by one of the following methods:

1. Truck Mixing

Concrete shall be mixed and delivered in a truck mixer. Mixers shall be charged with a ribbon fed mixture of aggregates and cements, or, in the absence of facilities for ribbon feeding, the aggregates shall be charged before the cement. When mixing is begun during or immediately after charging, a portion of the mixing water not in excess of that required to produce the minimum acceptable slump, shall be added ahead of, or with, the other ingredients. Total mixing shall be for not less than 50 nor more than 100 revolutions of the drum at the manufacturer's rated mixing speed after all ingredients including water are in the drum except as follows: After 30 to 75 revolutions of the drum the slump shall be tested and additional water shall be added if necessary to produce the required slump; if additional water is necessary, mixing shall be continued for at least 20 revolutions after the water is added. Mixing speed shall be not less than 4 rpm for resolving drum mixers, and not less than 4 rpm nor more than 16 rpm, for open-top mixers. Any turning of the drum during transportation shall be at the speed designated by the manufacturer of the equipment as agitating speed. Each batch of concrete delivered at the job site shall be accompanied by a time slip issued at the botching plant, bearing the time of departure there-from and the signature of the inspector. Discharge of concrete from the drum shall be completed within 1 hour or before the drum completes 250 revolutions after the introduction of water to the cement and aggregates.

2. Combination Central Plant and Truck Mixing (Shrink Mixing)

Concrete shall be partially mixed in a central plant mixer and the mixing completed in a truck mixer. The mixing time in a central-plant mixer shall be the minimum required to intermingle the ingredients and shall not exceed 30 seconds. The mixing shall be completed in a truck mixer as specified herein-before under truck mixing.

3. Concrete shall be mixed completely in a stationary mixer at a plant and transported to the site of the work in a truck agitator or a truck mixer operating at

a speed of rotation designated by the manufacturer as agitating speed. Mixing shall begin within 30 minutes after cement has been added to aggregates. When authorized in writing by the Owner, non-agitation equipment approved by him may be used for transporting concrete. The time lapse between the introduction of the mixing water to the cement and aggregates and the placing of concrete in final position in the forms, shall not exceed:

a) For agitating equipment – 60 minutes, air temperature less than 85 degrees Fahrenheit, 45 minutes, air temperature equal or greater than 85 degrees Fahrenheit.

b) for non-agitating equipment - 30 minutes.

2.1.12 Consistency of Concrete

Except as specified otherwise, the slump shall be from 2 to 4 inches and will be determined by the methods specified hereinafter.

3. EXECUTION

3.1 Inspection

Verify that earthwork is completed to correct line and grade, check that subgrade is smooth, compacted, and free of excessive moisture. Do not commence work until conditions are satisfactory.

3.2 Installation:

A. Curb and Gutters

1. Cast-In-Place Concrete:

a. Set forms to the required grades and line, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of the work, and so that forms can remain in place at least 24 hours after concrete placement. Check completed formwork for grade and alignment to the following tolerances:

Top of form units: not more than 1/8" 10'.

Vertical face: longitudinal axis, not more than ¼ " 10'.

Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage. Use an agent which will not discolor concrete.

b. Do not place concrete until subgrade and forms have been checked for line and grade. Moisture subgrade as required to provide a uniform dampened condition at the time concrete around structures or frames, if any, until they have been brought to the required grade and alignment. Place concrete in alternate panels 10' long, unless otherwise indicated, using methods which prevent segregation of the mix, and with as little rehandling as possible. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of joint materials.. Position integral curb joints at same location as pavement joints.

c. Concrete finishing: The form of the front of curbs shall not be removed in less than

two (2) hours nor more than six (6) hours after the concrete has been placed. All other forms and curbs shall remain in place for at least 24 hours after the concrete has been placed and finished.

d. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide a continuous, smooth finish.

e. Immediately after removing the form of the exposed surface of the curb and the top surface of the gutter shall be towelled smooth, then finished with a steel trowel and afterwards given a final fine brush stroke parallel to the line of traffic.

f. Curing Methods

Perform curing of concrete by moist curing, by moisture-retaining cover curing, by membrane curing, and by combination thereof, as herein specified.

Provide moisture curing by any of the following methods:

Keeping the surface of the concrete continuously wet dry covering with water.

Continuous water-fog spray.

Covering the concrete surface with the specified absorptive cover, thoroughly saturating the cover with water, and keeping the absorptive cover continuously wet. Place absorptive cover so as to provide coverage of the concrete surfaces and edges, with a 4" lap over adjacent absorptive covers.

Provide moisture-cover curing as follows:

Cover the concrete surfaces with the specified moisture-retaining cover for curing concrete, placed in the widest practicable width with side and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during the curing period using cover material and waterproof tape.

Provide membrane curing as follows:

Apply the specified membrane-forming curing compound to damp concrete surfaces as soon as the water film has disappeared. Apply uniformly in a 2-coat continuous operation by power spray equipment in accordance with the manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application.

g. Expansion Joints

Provide premolded joint filler for expansion joints.

Locate expansion joints at intervals not greater than 25' or where curbs and gutters adjoint catch basins, manholes, structures or walks.

Extend joint fillers full width and depth of the joint, and not less than 3/4" or more than 1" below the finished surface. Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Conform top edge of filler to top profile of curbs and gutters..

Protect the top edge of the joint filler during concrete placement with temporary

material. Remove protection after both sides of joint are placed.

Fill joints neatly with hot poured asphaltic expansion joint sealer in the manner specified by the sealer manufacturer. Sealer shall not be allowed to drip on or overrun the curbs and gutters surface.

Vertical face: longitudinal axis, not more than 10' 1/4".

Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage. Use an agent which will not discolor concrete.

h. Do not place concrete until subgrade and forms have been checked for line and grade. Moister subgrade as required to provide a uniform dampened condition at the time coancrete is placed. Do not place concrete around structures or frames, if any, until they have been brought to the required grade and alignment. Place concrete in alternate panels 10' long unless otherwise indicated, using methods which prevent segregation of the mix, and with as little rehandling as possible. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of joint materials. Position integral curb joints at same location as pavement joints.

i. Concrete finishing: The form of the front of curbs shall not be removed in less than two (2) hours nor more than six (6) hours after the concrete has been placed. All other forms of curbs shall remain in place for at least 24 hours after the concrete has been placed and finished.

j. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities and refloat repaired areas to provide a continuous, smooth finish.

k. Immediately after removing the form of the exposed surface of the curb and the top surface of the gutter shall be towelled smooth, then finished with a steel trowel and afterwards given a final fine brush stroke parallel to the line of traffic.

l. Curing Methods

Perform curing of concrete by moist curing, by moisture-retaining cover curing, by membrane curing, and by combination thereof, as herein specified.

Provide moisture curing by any of the following methods:

Keeping the surface of the concrete continuously wet by covering with water.

Continuous water-fog spray.

B. Sidewalks

1. Cast-in-Place Concrete
   a. Finish the surfaces to grade and cross section with a metal float, trowled smooth and finished with a broom moistened with clear water.
   b. Brooming shall be transverse to the line of traffic.

c. Finish all slab edges, including those at formed joints, carefully with an edger having a radius as shown on the Drawings.

d. Unless otherwise indicated, edge the transverse joints before brooming. The brooming shall eliminate the flat surface left by the surface face of the edger. Execute the brooming so that the corrugation, thus produced, will be uniform in appearance and not more than 2 mm (1/16 inch) in depth.

e. The completed surface shall be uniform in color and free of surface blemishes, form marks, and tool marks. The finished surface of the pavement shall not vary more than 5 mm (3/16 inch) when tested with a 3000 mm (10 foot) straightedge.

f. The thickness of the pavement shall not vary more than 6 mm (1/4 inch).

g. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.

3.3 Repair and Protection

Repair or replace broken or defective curbs, gutters, and sidewalks, as directed.

Protect the curbs, gutters, and sidewalks from damage until acceptance of the work. Exclude traffic from curbs, gutters, and sidewalks for at least 14 days after placement. When construction traffic is permitted, maintain curbs, gutters, and sidewalks as clean as possible by removing surface stains and spillage of materials as they occur.

Sweep concrete curbs, gutters, and sidewalks and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

*****END OF SECTION 02 62 00*****

SECTION 02 66 80
WATER SERVICE PIPING

PART 1 - GENERAL

1.01 SUBMITTALS

A. Submit the following:

1. Shop drawings for cast-in-place concrete valve pits and meter pit, including frames and covers.

2. Maintenance data for valves and meter, for inclusion in Operating and Maintenance Manuals.

B. Comply with requirements of utility supplying water to the project.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe and fitting materials shall be compatible with each other. Where more than one type of materials or products is indicated, selection in Installer's option.

B. PVC (Polyvinyl Chloride) Pipe 4 Inches and larger: AWWA C900; Class 200, with bell end and elastomeric gasket, with plain end for cast-iron or ductile-iron fittings, or with plain end for PVC elastomeric gasket fittings.

C. Gaskets: ASTM F 477, elastomeric seal.

D. PVC Couplings and Fittings: AWWA C110, ductile-iron or cast-iron, 250 psi pressure rating; or AWWA C153, ductile-iron compact fittings, 350 psi pressure rating; of dimension to match pipe outside diameter.

F. Lining: AWWA C104, cement mortar.

G. Gaskets: AWWA C111, rubber.

H. Non-Rising Stem Gate Valves 3 Inches and Larger: AWWA C500, cast-iron double disc; bronze disc and seat rings, or AWWA C 509, resilient seated; bronze stem, cast iron or ductile iron body bonnet, stem nut, 200 psi working pressure, mechanical joint ends.

I. Valve Boxes: Cast-iron box having top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide a steel tee handle operating wrench with each valve box. Wrench shall have tee handle with one pointed end, stem of length to operate valve, and socket fitting valve operating nut.

J. Tapping Sleeve and Tapping Valve: Provide a complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. The sleeve and the valve shall be compatible with the tapping machine to be used.

1. Tapping Sleeve: Cast-iron or ductile-iron 2-piece bolted sleeve with flanged outlet

for new branch connection. Sleeve may have mechanical joint ends with rubber gaskets or have sealing rings in the sleeve body. Sleeve shall mate with the size and type pipe material being tapped. Outlet flange shall be size required for branch connection.

K. Service Clamps and Corporation Stops: Provide a complete assembly, including service clamp, corporation stop, and bolts and nuts. The clamp and stop shall be compatible with the drilling machine to be used.

1. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.

2. Corporation Stops: Bronze body and ground key plug, with AWWA C800 stops, and outlet to match service piping material.

L. Manifold: Copper with two to four inlets, as required, with ends matching corporation stops, and outlet matching service piping.

M. Anchorage Materials as follows:

1. Clamps, Straps, and Washers: ASTM A 506, Steel.

2. Rods: ASTM A 575, Steel.

3. Rod Couplings: ASTM A 197, Malleable-iron.

4. Bolts: ASTM A 307, Steel.

5. Cast-Iron Washers: ASTM A 126, Gray-iron.

N. Concrete Reaction Backing: Portland cement concrete mix, 3,000 psi.

1. Cement: ASTM C 150, Type I.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water; Potable.

O. Fire Hydrants: Muller centurian, 3 way hydrants.

P. Valve Pit and Meter Pit Materials:

1. Concrete: Portland cement mix, 3,000 psi.

2. Cement: ASTM C 150, Type I.

3. Fine Aggregate: ASTM C 33, sand.

4. Coarse Aggregate: ASTM C 33, crushed gravel.

5. Water: Potable.

Q. Reinforcement: Steel conforming to the following:

1. Fabric: ASTM A 185, Welded wire fabric, plain.

2. Reinforcement Bars: ASTM A 615, Grade 60, deformed.

R. Ladder: ASTM A 36, steel, or may be polyethylene encased cast iron or steel steps.

S. Provide water meter with registration in gallons and type as follows:

1. Water Meter - 2 Inches and Smaller: AWWA C700, disc type, bronze case.

2. Water Meter - 3 Inches and Larger: AWWA C702, compound type, bronze case.

T. Remote Registration System: Utility company standards.

U. Meter Box Cast iron body, cast iron cover having lettering "WATER METER", and base section, of length to fit to fit over service piping. The base section shall be open at the bottom, slotted, and may be cast iron, PVC, or a piece of clay or other pipe.

G. Plastic Underground Warning Tapes: Polyethylene plastic tape, 6 inches wide by 4 mils thick, solid blue in color with continuously-printed caption in black letters "CAUTION-WATER LINE BURIED BELOW".

PART 3 - EXECUTION

3.01 INSTALLATION

A. Prepare Foundation for Buried Water Service Piping as Follows:

1. Grade trench bottom to provide a smooth, firm, stable, and rock free foundation, throughout the length of the piping.

2. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated level.

3. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads, and to ensure continuous bearing of the pipe barrel on the foundation.

4. Polyethylene Encasement: Install in accordance with AWWA C105.

B. PVC (Polyvinyl Chloride) Pipe: Install with cement mortal lined, ductile-iron or cast-iron mechanical joint or push-on joint fittings, and rubber gaskets; in accordance with AWWA M23.

C. Water Main Connection: Tap water main with size and in location as indicated, in accordance with requirements of water utility.

D. Water Service Termination: Terminate water service piping 5'-0" from building foundation in location and invert as indicated. Provide temporary pipe plug for piping extension into building.

E. Valve Application: Use mechanical joint end valves for 3-inch and larger buried installation. Use threaded and flanged end valves for installation in pits and inside building. Use bronze corporation stops and valve, with ends compatible to piping, for 2-inch and smaller installation.

F. AWWA Type Gate Valve: Company with AWWA C600. Install buried valves with stem pointing up and with cast iron valve box.

G. Provide anchorages for tees, plugs and caps, bends, crosses, valves and hydrant branches.

1. Apply full coat of asphalt or other acceptable corrosion retarding material to surfaces of installed ferrous anchorage devices.

H. Construct valve pits and meter pit of poured-in-place or precast concrete of dimensions indicated, with manhole frame and cover, ladder, and rain. Provide sleeves with waterproof sleeve seals for pipe entry and exit.

I. Water Meter: Install water meter in accordance with AWWA M6, in meter pit, in location and with support as indicated. Provide 3-valve bypass around meter, full size or water service piping.

J. Install continuous underground warning tape during back-filling of trench for underground water service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.02 TESTING

A. Conduct piping tests before joints are covered, and after thrust blocks have sufficiently hardened. Fill pipeline 24 hours prior to testing, and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than 1½ times working pressure for 2 hours.

1. Increase pressure in 50 psi increments and inspect each joint between increments. Hold at test pressure for one hour, decrease to 0 spi. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits..

2. Clean and disinfect water distribution piping as follows:

3. Purge all new water distribution piping systems and parts or existing systems that have been altered, extended, or repaired, prior to use.

a. Use the purging and disinfecting procedure proscribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:

b. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.

c. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.

d. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.

e. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.

4. Prepare reports for all purging and disinfecting activities.

*****END OF SECTION 02 66 80*****

SECTION 02 72 00
STORM SEWERAGE

PART 1 - GENERAL

1.01 SUBMITTALS

Submit the following:

A. Product data for drainage piping specialties.

B. Shop drawings for precast concrete storm drainage and catch basins, including frames, covers, and grates.

C. Shop drawings for cast-in-place concrete or field erected masonry storm drainage manholes and catch basins, including frames and covers.

D. Environmental Compliance: Comply with applicable portions of local and federal environmental agencies regulations pertaining to storm sewerage.

E. Utility Compliance: Comply with local utility regulations and standards pertaining to storm sewerage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe and Fittings: Provide pipe and fitting materials compatible with each other. Where more than one type of materials or products is indicated, selection is Installer's option.

B. Reinforced Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, for rubber gasket joints.

C. Gaskets: ASTM C 443, rubber.

D. Precast Concrete Manholes: ASTM C 478, precast reinforced concrete, of depth indicated with provision for rubber gasket joints.

1. Base Section: 6-inches minimum thickness for floor slab and 4-inches minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor.

2. Riser Sections: 4-inches minimum thickness; 48-inches diameter and lengths to provide dept indicated.

3. Top Section: Eccentric cone type, unless concentric cone or flat slab top type is indicated. Top of cone to match grade rings.
4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness and match 24-inch diameter frame and cover.

5. Gasket: ASTM C 443, rubber.

6. Steps: Cast into base, riser, and top sections sidewall at 12 to 16-inch intervals.

7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe

connecting to base section.

8. Channel and Bench: Concrete.

E.. Cast-in-Place Manhole: Reinforced concrete of dimensions and with appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.

2. Channel and Bench: Concrete.

3. Steps: Cast into sidewall at 12 to 16-inch intervals:

F.. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, heavy-duty, ductile-iron, 24-inch inside diameter by 7 to 9-inch riser with 4-inch minimum with flange, and 26-inch diameter cover, indented top design, with lettering "STORM SEWER" cast into cover.

G. Precast Concrete Catch Basins: ASTM C 478 or ASTM C 858, precast reinforced concrete, of depth indicated. Sections shall have provision for rubber gasket joints. Base section slab have minimum thickness of 6 inches, riser sections shall have minimum thickness of 4 inches and be 48 inches inside diameter, and top section and grade rings shall match 24-inch frame and grate, unless otherwise indicated.

1. Base Section: Base riser section and separate base slab, or base riser section with integral floor.

2. Riser Sections: Sections shall be of lengths to provide depth indicated.

3. Top Section: Flat slab type with opening to match grade rings.

4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness.

5. Gasket: ASTM C 443, rubber.

6. Steps: Cast into riser sidewall at 12 to 16-inch intervals.

7. Pipe Connectors ASTM C 923, resilient, of size required, for each pipe connecting to base section.
8. Channel and Bench: Concrete.

H.. Cast-in-Place Manhole: Reinforced concrete of dimensions and with appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.

2. Channel and Bench: Concrete.

3. Steps: Cast into sidewall at 12 to 16-inch intervals.

I. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, heavy-duty, ductile-iron, 24-inch inside diameter by 7 to 9-inch riser with 4-inch minimum width flange, and 26-inch diameter cover, indented top design, with lettering "STORM SEWER" cast into cover.

J. Precast Concrete Catch Basins: ASTM C 478 or ASTM C 858, precast reinforced concrete, or depth indicated. Sections shall have provisions for rubber gasket joints. Base section slab shall have minimum thickness of 6 inches, riser sections shall have minimum thickness of 4 inches and be 48 inches inside diameter, and top section and grade rings shall match 24-inch frame and grate, unless otherwise indicated.

1. Base Section: Base riser section an separate base slab, or base riser section with integral floor.

2. Riser Section: Sections shall be of lengths to provide depth indicated.

3. Top Section: Flat slab type with opening to match grade rings.

4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness.

5. Gasket: ASTM C 443, rubber.

6. Steps: Cast into riser sidewall at 12 to 16-inch intervals.

7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

8. Channel and Bench: Concrete.

K. Cast-in-Place Catch Basins: Reinforced concrete of dimensions and with appurtenances indicated.

1. Bottom, Walls, and Top: Reinforced concrete.

2. Channel and Bench: Concrete.

L.. Catch Basin Frames and Grates: ASTM A 536 Grade 60-40-18, heavy-duty, ductile-iron, 24-inch inside diameter by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch diameter flat grate having small square or short slotted drainage openings.

M. Curb Inlets: Precast concrete, and or dimensions conforming to utility standards.

N. Trench Drain System: Provide modular channel trench drain system of channels, grates, and accessories, as indicated.

1. Channels: Interlocking precast polymer concrete modular units, 6 inches wide, with built-in slope of 0-6 percent, and rounded inside bottom surface.

2. Grates: Cast-iron, heavy-duty, designed to set in channel top recess without rocking or rattling.

3. Accessories: Catch basins, channel caps, and other accessories of same material as channel, as indicated.

4. Concrete: See cast-in-place concrete.

O.. Plastic Underground Warning Tapes: Polyethylene tape, 6 inches wide by 4 mills thick, solid green in color with continuously caption in black letters "CAUTION-

SEWER LINE BURIED BELOW".

PART 3 - EXECUTION

3.01 INSTALLATION

A. Prepare Foundation for Buried Storm Sewerage Piping as follows:

1. Grade trench bottom to provide a smooth, firm, stable, and rock free foundation, throughout the length of the pipe.

2. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with clean sand or pea gravel to indicated level.

3. Shape bottom of trench to fit bottom of pipe. Fill unevenness with tamped sand backfill. Dig bell holes at each pipe joint to relieve the bells of all loads, and to ensure continuous bearing of the pipe barrel on the foundation.

B. Install piping beginning at low of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.

C. Use manholes or catch basins for changes in directions, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and coupling, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.

E. Install piping pitched down in direction of flow, at slope shown.

F. Extend storm sewerage piping to connect to building storm drains, of size and in location indicated.

G. Join concrete pipe and fittings with rubber gaskets in accordance with ASTM C 443 and install piping in accordance with applicable provisions of ACPA "Concrete Pipe Installation Manual".

H. Install manholes complete with accessories as indicated. Form continuous concrete or split pipe section channel and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 3 inches above finish surface, unless otherwise indicated.

I. Place precast concrete manhole sections as indicated, and install in accordance with ASTM C 891.d

J. Construct cast-in-place manholes as indicated.

K. Provide rubber joint gasket complying with ASTM C 443 joints of sections.

L. Apply bituminous mastic coating at joints of sections.

M. Construct catch basins to sizes and shapes indicated.

N. Set frames and grates to elevations indicated.

O. Construct outfalls of reinforced concrete which attain 28-day compressive strength of not less than 3000 psi.

P. Install drywells as indicated, set on undisturbed native soil.

Q. Fill: Pack around dry well with 1- to 2-inch size crushed rock or gravel, to minimum of 12 inches beyond dry well perimeter, and full depth of dry well.

R. Install trench drains as indicated and in accordance with the manufacturer's installation instructions.

S. Embed channels in minimum of 4 inches depth of concrete around bottom and sides.

T. Make connections to existing piping and underground structures, so that finished work will conform as nearly as practicable to the requirements specified for new work.

U. 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 3000 psi 28-day compressive strength concrete.

V. Make branch connections from side into exiting box culvert or to underground structure by cutting opening into existing unit, sufficiently large 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 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.

1. Provide concrete which will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2. Use epoxy bonding compound as interface between new and existing concrete and piping materials.

3. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material which may accumulate.

W. Abandoned Piping: Close open ends of abandoned underground piping which is indicated to remain in place. Provide sufficiently strong closures to withstand hydro-static or earth pressure which may result after ends of abandoned utilities have been closed.

X. Abandoned Structures: Remove structure and close open ends of the remaining piping; or remove top of structure down to not less than 3 feet below final grade, fill structure with stone, rubber, gravel, or compacted dirt, to within 1 foot of top of structure remaining, and fill with concrete.

3.02 TESTING

A. Testing: Perform testing of complete piping in accordance with local authorities having jurisdiction.

B. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is complete.

   1. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.

   2. Flush piping between manholes, if required by local authority, to remove collected debris.

C. Interior Inspection: Inspect piping to determine whether line displacement or other damage has occurred.

   1. Make inspections after pipe between manhole locations, has been installed and approximately 2 feet of backfill is in place, and again at completion of project.

   2. If inspection indicated poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects, and reinspect.

*****END OF SECTION 02 72 00*****

SECTION 02 73 00
SANITARY SEWER PIPE

PART 1 - GENERAL

1.1 **DESCRIPTION OF WORK**: The extent of sanitary sewer work is indicated on the drawings.

1.2 **QUALITY ASSURANCE**

A. Codes and standards:

1. Federal Specifications:

RR-F-621C Frames, covers, gratings, steps, sumps, and catch basins, manholes

2. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

C 478 Precast Reinforced Concrete Manhole Sections

D 1557 Moisture Density Relations of Soils and Soil-Aggregate Mixture using 10 lb hammer and 18-inch drop.

D 3033 Type PSP Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

D 3034 Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

3. UNI-BELL PLASTIC PIPE ASSOCIATION (UNI)

Publication

UNI-B-5 Installation of Polyvinyl Chloride (PVC) Sewer Pipe.

4. ALLOWABLE TOLERANCES:

a) Rate of leakage for any gravity line sections, or for total length of pipe lines should not be greater 100 gallons per inch of pipe diameter per mile per 24 hours. See note on drawings.

b) Force mains shall have zero leakage in 30 minutes at 150 percent of the maximum pressure that the pump or ejector is capable of developing.

c) Joints shall conform to ASTM D 3232. Gaskets shall conform to ASTM F 477.

1.3 **SHOP DRAWINGS**: Submit shop drawings for the followings:

a. Precast Concrete Manholes

b. Metal Work

1.4 **MANUFACTURER'S DATA**: Submit manufacturer's standard drawings or catalog cuts of the following items:

a. Fittings

b. Joints and couplings

1.5 **DELIVERY AND STORAGE OF MATERIALS**:

a. Piping: Inspect materials delivered to site for damage, store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and rubber gaskets under cover out of direct sun light. Do not store materials directly on the ground.

1.6 **HANDLING**: Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition.

PARTE 2 - MATERIALS:

2.1 Gravity sewer piping:

2.1.1 Polyvinyl Chloride (PVC) plastic pipe:

a. Pipe and fittings: Pipe and fittings shall conform to ASTM C 3033, shall be SDR 35, with ends suitable for elastomeric plastic joints.

b. Joints and jointing material; Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

2.2 Pressure piping: (When required)

2.2.1 Polyvinyl Chloride (PVC) Plastic Pressure Pipe and Associated Fittings.

2.2.1.1 Pipe and Fittings: Pipe shall conform to AWWA C 900 and shall be plain end or gasket bell end, Pressure Class 150 (DR 18) with cast-iron-pipe-equivalent OD. Fittings shall be gray-iron or ductile-iron conforming to AWWA C 110 and shall have cement-mortar lining conforming to AWWA C 104, standard thickness. Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that bell design shall be modified, as approved, for push-on joint suitable for use with the PVC plastic pressure pipe specified in this paragraph.

2.2.1.2 Joints and jointing material: Joints for pipe shall be push-on joints as specified in ASTM D 3139. Joints between pipe and fittings shall be push-on joints as specified in ASTM D 3139 or shall be compression-type joints/mechanical joints, as respectively, specified in ASTM D 3139 and AWWA C 111/A21.11. Each joint connection shall be provided with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets for push-on joints and compression-type joints/mechanical-joints for joint connections between pipe and fittings shall be as specified in AWWA C 111/A.21.11, respectively for push-on joints and mechanical-joints.

2.3 Concrete Materials: Concrete materials shall be as specified on Section, "Cast in Place Concrete".

2.4 Reinforcement: Reinforcement shall be deformed steel bars, as specified in Section, "Concrete Reinforcement".

2.5 Precast Concrete Manhole Sections: Precast concrete manhole risers, base sections, and tops shall conform to ASTM C 478.

2.6 Metal items:

a. Frames, Covers, and Gratings: Frames, covers, and grating shall conform to Fed. Spec. RR-F-621 and shall be of cast iron.

b. Manhole steps: Manhole steps shall conform to Fed. Spec. RR-F-621 and shall be of cast iron. Steps are not required in manholes less than 4 feet deep.

c. Furnish covers with cast-in-legend "SANITARY" on roadway face.

PART 3 - EXECUTION

3.1 Installation of Plastic (PVC) pipelines: Install pipe in accordance with the general requirements for installation of pipelines and with the requirements of UNI-B-5 for laying and joining pipe and fittings. Make joints with the gaskets previously specified for joints with this piping; assemble these joints in accordance with the requirements of UNI-B-5 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

3.2 Excavation: Perform trench excavation for sanitary sewer to line and grade shown in accordance with section titled TRENCHING (**SECTION 02225)**.

3.3 Manhole Construction: Construct base slab of cast in-place concrete or use precast concrete base sections. Make inverts in cast-in-place concrete or precast concrete bases with a semi circular bottom conforming to the inside of the adjacent sewer section. Shape inverts accurately and give them a smooth finish. For changes in direction of the sewer and entering branches into the manhole make a circular curve in the manhole invert of as large a radius as manhole size will permit. For cast-in-place concrete construction, pour bottom slabs and walls integrally. Where this is not practicable, key bottom slabs a wall and bond together properly. Where manholes occur in pavements, set top of frames and covers flush with finish surface. Elsewhere, set top 3 inches above finish surface, unless otherwise indicated.

3.4 Backfilling:

3.4.1 Conduct backfill operations of open-cut trenches closely following laying, jointing, and bedding of pipe, and after initial inspection and testing are completed.

3.4.2 Bedding Requirements: AWWA C 600, Type 4, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of ASTM D 1557 maximum density Polyvinyl chloride (PVC) shall have bedding to springline of pipe. Materials shall be Class I, II and III in accordance with ASTM D 2321.

3.4.3 Continue remainder of backfilling, as specified in Section 02225 TRENCHING.

3.4.4 Field Tests and Inspections:

3.4.4.1 General: The Contractor shall perform all field tests and provide all labor, equipment and incidentals required for testing. The Contractor shall be able to produce evidence, when required, that any item of work has been constructed properly in accordance with drawings and specifications.

3.4.4.2 Tests Procedures: Non-pressure lines. Check each straight run of pipeline for gross deficiencies by holding a light in manhole; it shall show a practical full circle of light through the pipeline when viewed form the adjoining end of line.

3.4.4.3 Leakage Tests: Tests lines for leakage by either infiltration or exfiltration test, as specified in this paragraph. Prior to testing for leakage, backfill trench up to at

least half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent moment, but leaving joints uncovered to permit inspection. The test shall be performed by filling the pipe with water at the upstream manhole and allowing the pipe to remain filled for a period of 72 hours prior to checking the leakage. The allowable leakage must not to exceed 100 gallons per inch of pipe diameter per mile in a 24 hours period. If local jurisdiction authorities or codes are more stringent, they shall prevail.

3.4.4.4 Deflection Testing: Make a deflection test on entire length or installed plastic pipeline on completion of all work adjacent to and over the pipeline. Deflection of pipe in the installed pipeline on all external loads shall not exceed 4.5 percent of the normal inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of (a) a pull-through device, or (b) a deflection measuring device.

*****END OF SECTION 02 73 00*****

SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Provide cast-in-place concrete for general building construction, including, without limitation:

1. Footings, foundations, and basement walls.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Mix Design: Submit for approval mix design proposed for use.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Testing: Employ an independent testing agency acceptable to Owner to design concrete mixes and to perform material evaluation tests. Provide 7 and 28 day cylinder tests. Comply with ASTM C 143, C 173, C 31 and C 39.

C. Standards:

1. ACI 301, Specifications for structural Concrete for Buildings.
2. ACI 318, Building Code Requirements for Reinforced Concrete, and CRSI Manual of Standard Practice.

D. Mock-Ups: Provide mock-up as required to demonstrate quality of workmanship.

E. Floor Flatness and Levelness Tolerances:

1. Subfloors Under Materials Such as Concrete Toppings, Ceramic Tile, and Sand Bed Terrazzo: ACI 302.1R and ASTM E 1155, floor flatness (Ff) of 15, floor levelness (Fl) of 13.
2. Subfloors Under Materials Such As Vinyl Tile, Epoxy Toppings, Paint, and Carpet: ACI 302.1R and ASTM E 1155, floor flatness (Ff) of 20, floor levelness (Fl) of 17.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Design Mixes, ASTM C 94, 28 Day Compressive Strength:

1. Columns, Beams, Walls, Roof Slab, and Footings:
   a. Compressive Strength: 3500 psi.
2. Slabs on Grade and Paving Base:
   a. Compressive Strength: 3000 psi.
3. Exterior Site Concrete and Pads Exposed to Weather:

a. Compressive Strength: 3000 psi.

B. Formwork: Plywood or metal panel formwork sufficient for structural and visual requirements.

1. Special forms for textured finish concrete.
2. Metal, plastic or paper tubes for cylindrical columns and supports.

C. Reinforcing Materials:

1. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
2. Steel Wire: ASTM A 82.

D. Concrete Materials: ASTM C 150, Type I, Portland cement; potable water.

1. Normal weight aggregates, ASTM C 33.

E. Concrete Admixtures: Containing less than 0.1 percent chloride ions.

1. High-Range Water-Reducing Admixture, Super Plasticizer: ASTM C 494, Type F or G for placement and workability.
2. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E for placement and workability.
3. Water-Reducing, Retarding Admixture: ASTM C 494, Type D for placement and workability.

F. Auxiliary Materials:

1. Reglets: Galvanized sheet steel reglets, minimum 26 gauge (.018 inch).
2. Waterstops: Rubber or PVC waterstops.
3. Vapor Retarder: ASTM E 154 polyethylene sheet, 8 mils.
4. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type 1, Class B.
5. Evaporation Control Compound: Monomolecular film-forming compound.
6. Bonding Compound: Polyvinyl acetate or acrylic base.
7. Epoxy Adhesive: ASTM C 881, two-component material.

G. Concrete Finishes for Formed Surfaces:

1. Surfaces Not Exposed to View: As-cast form finish.
2. Surfaces Exposed to View: Smooth rubbed finish.

H. Concrete Finishes for Monolithic Slabs:

1. Scratch finish for surfaces to receive concrete floor topping or mortar setting bed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with ASTM C 94. Do not change mix design without approval. Calcium chloride admixtures are not permitted.

B. Tolerance: Plus 1/8" in 10' for grade, alignment, and straightness.

C. Construction Joints: Use keyways, continue reinforcement through joint.

D. Expansion Joints: For exterior work locate 30' o.c. at approved locations. Provide smooth dowels across joint which permit 1" horizontal movement and no vertical shear movement.

E. Isolation Joints: Provide between slabs and vertical elements such as columns and structural walls.

F. Wall Finishes: As-cast and patched for concealed work; rubbed smooth, filled and cement paste coated for exposed work.

G. Cure and protect work. Report defective work in writing.

END OF SECTION

SECTION 03 35 00
CONCRETE FINISHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Decorative Concrete Floor Finish Systems:
   1. Permanent concrete acid stain for interior or exterior concrete.
   2. Polymer stain for interior and exterior horizontal and vertical surfaces.
   3. Sealer for interior concrete floor surfaces.
   4. Acrylic polymer wax for interior concrete floor surfaces.
   5. Concrete floor sealer.
   6. Clear penetrant for concrete finishes.
   7. Cleaners for surface preparation.

B. High Performance Coatings:
   1. Polyaspartic coatings.
   2. Polyurethane coatings.
   3. Epoxy coatings.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 09 64 00 - Wood Flooring.

C. Section 09 91 23 - Interior Painting.

1.3 REFERENCES

A. ASTM D 2240 - Standard Test Method for Rubber PropertyDurometer Hardness.

B. South Coast Air Quality Management District (SCAQMD) Rule 13 (2008).

C. SSPC-SP1 - Solvent Cleaning.

D. SSPC-SP2 - Hand Tool Cleaning.

E. SSPC-SP3 - Power Tool Cleaning.

F. SSPC-SP6/NACE 3 - Commercial Blast Cleaning.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Surface preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches

(150 mm) square representing actual product, color, and patterns.

E. Installer's Project References: Submit list of successfully completed projects, including project name and location, name of architect, and type and quantity of finish systems applied.

F. Maintenance Instructions: Submit manufacturer's maintenance and cleaning instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Successful experience in application of similar finish systems.
   2. Employ persons trained for application of finish systems.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

C. Single Source Responsibility: Materials shall be products of a single manufacturer.

D. Pre-installation Meeting: Convene a meeting before the start of the application of. Require attendance of parties directly affecting work of this section, including Contractor, Architect, and applicator. Review surface preparation, application, protection, and coordination with other work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Concrete Floor Wax and Concrete Floor Sealer: Keep away from ignition sources. Do not allow to freeze.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Exterior Surfaces: Do not apply materials in wet weather.

C. Concrete Floor Wax: Do not apply when air or surface temperature is below 55 degrees F (13 degrees C).

D. Concrete Floor Stain: Do not apply when air or surface temperature is below 40 degrees F (4 degrees C).

E. Concrete Floor Sealer: Do not apply when air or surface temperature is below 55 degrees F (13 degrees C).

1.8 SEQUENCING

A. Prepare surface and apply coatings after other interior finish work is completed and before

baseboards and trim are installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: EPMAR Corporation, which is located at: 13240 Barton Circle; Whittier, CA 90605-3254; Toll Free Tel: 800-875-4596; Tel: 562-236-1170; Fax: 562-944-9958 ; Email:request info (thiele@quakerchem.com); Web:https://www.kemiko.com/?utm_source=ARCAT&utm_medium=Banner&utm_campaign=Profile&utm_content=URL_HOME

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 CONCRETE FLOOR STAIN

A. Product: Kemiko Stone Tone Acid Stain as manufactured by Epmar Corporation.
   1. Type: Combination of acid solution, wetting agents, and metallic ions. When mixed with water, chemically combines with Portland cement to form permanent colors.
   2. Interior or Exterior Application.
   3. Color: Malay Tan.
   4. Color: Green Lawn.
   5. Color: Black.
   6. Color: Cola.
   7. Color: English Red.
   8. Color: Aqua Blue.
   9. Color: Golden Wheat.
   10. Color: Vintage Umber.
   11. Color: Walnut.
   12. Color: Garden Gold.

2.3 POLYMER STAIN

A. Polymer Stain: Rembrandt Polymer Stain as manufactured by Epmar Corporation.
   1. Water-extended, acrylic urethane polymer solution with added pigments.
   2. Volume Solids: 20 percent.
   3. VOC: Less than 30000 ppm (30 g/L). Meets final SCAQMD Rule 13 (2008)
   4. Interior or Exterior Application.
   5. Base Color: Adobe.
   6. Base Color: Black.
   7. Base Color: Oyster.
   8. Base Color: Sand.
   9. Base Color: Tweed.
   10. Base Color: White.
   11. Color: Phthalo Blue.
   12. Color: Medium Yellow.
   13. Color: Yellow Oxide.
   14. Color: Monoazo Red.
   15. Color: Red Oxide.
   16. Color: Orange.
   17. Color: Phthalo Green.
   18. Color: Raw Umber.
   19. Color: Raw Sienna.
   20. Color: Burnt Umber.

21. Color: Burnt Sienna.
22. Color: Violet.

2.4 SEALER

A. Floor Sealer: Kemiko Clear-A-Thane as manufactured by Epmar Corporation.
1. Type: Acrylic Urethane Sealer.
2. Interior/Exterior.
3. Solids Content: 30 percent.
4. U.V. resistant.
5. Resistant to blushing.
6. Clear gloss/satin.
7. VOC compliant.
8. Quick drying.

2.5 ACRYLIC POLYMER WAX

A. Acrylic Polymer Wax: Kemiko Easy Shine Mop On as manufactured by Epmar Corporation.
1. Type: A low VOC single component waterborne acrylic polymer wax designed to repel water, reduce scuffing and marring, allows substrate to breath, is low odor, and produces a deep rich shine.
2. Clear gloss/Satin Finish Available.
3. Interior Only.

2.6 CLEAR PENETRATING SEALER

A. Clear Penetrant: Kemiko Repels. As manufactured by Epmar Corporation.
1. Type: Silane/Siloxane water repellant.
2. Solids. 5.5 percent.
3. Breathable system.
4. Reduces efflorescent.
5. U.V and alkalinity resistant.

2.7 CLEANER

A. Water Base Cleaner (alkaline concentrate in water): Kemiko Neutra Clean as manufactured by Epmar Corporation.
1. Type: Industrial strength, low VOC, high performance water base sodium metasilicate cleaner for the preparation of bare concrete and coated substrates, staining, sealing, and recoating.
2. Biodegradable with low odor.
3. Used to neutralize Kemiko Concrete Acid Stains.

B. Heavy Duty Water Base Stripper: Kemiko Easy Strip as manufactured by Epmar Corporation.
1. Type: High performance Ammonia/Alkaline concentrate in water base wax stripper designed specifically for removing Kemiko Stone Tone and Kemiko Easy Shine waxes.
2. Biodegradable with low ammonia odor.

2.8 POLYASPARTIC COATINGS

A. High Solids Polyaspartic:
1. Product: Kemiko SS3900.
2. Type (ASTM D523): High gloss at 60 degrees, greater than 80.
3. Volume Solids: 90 percent.
4. VOC: Less than 50000 ppm (50 g/L).

5. Flash Point: Greater than 200 degree F.
6. Mix Ratio: 1:1 (A:B) by volume.
7. Pot Life (0.8 gal mass): 20 minutes at 70 degree F. 50 percent RH.
8. Dry Time: At 70 degree F, 50 percent RH: 2 to 3 hours to touch, recoat within 3/24 hours. 3 to 4 hours for foot traffic. 7 to 10 days for full chemical and physical properties depending on substrate temperature and humidity.
9. Film Thickness: 5 to 10 mils on horizontal substrates.
10. Thinning: None recommended.
11. Primers - Concrete: Kemiko SS1600, Kemiko SS3700, and 3400.
12. Colors: Clear.
13. Topcoat: None required.

2.9 POLYURETHANE COATINGS

A. Waterborne Aliphatic Polyurethane Coating:
1. Product: Kemiko SS2400.
2. Type: Two component, waterborne, aliphatic polyurethane coating.
3. Flash Point: Greater than 200 degree F (93 degree C) Nonflammable.
4. Sheen: High gloss.
5. Dry Film Thickness: 2 to 3 mils.
6. Mix Ratio: Clear - 1:4 (A:B) by volume.
7. Volume Solids: Clear; 44 percent.
8. Maximum VOC: 50000 ppm (50 g/L). Meets final SCAQMD Rule 1113.
9. Pot Life at 70 degree F (21 degree C): 60 minutes at 50 percent RH.
10. Dry Time at 70 degree F (21 degree C) and 50 percent RH. 6 to 8 hours to touch; Light Foot traffic in 20 to 24 hours; Heavy traffic in 24 to 8 hours; Full cure and chemical resistant in 5 to 7 days.
11. Recoat Intervals: 50 degree F (10 degree C); minimum 12 hours, maximum 72 hours.
12. Recoat Intervals: 70 degree F (21 degree C); minimum 6 hours, maximum 24 hours.
13. Recoat Intervals: 90 degree F (32 degree C); minimum 3 hours, maximum 12 hours.
14. Film Thickness: 4.5 to 7 mils (wet to achieve 2 to 3 mils dry film thickness. Do not exceed 6 mils wet film thickness or air entrapment and foaming may occur.
15. Primer: Kemiko SS1600.
16. Primer: Kemiko SS3700.
17. Primer: Kemiko SS3400.
18. Color: Clear.
19. Special colors available upon request.

2.10 EPOXY COATINGS

A. Moisture Vapor Barrier System (Positive and Negative Side): High solids epoxy.
1. Product: Kemiko SS1120.
2. Type: Two component polyamide amine cured epoxy.
3. VOC: Less than 50000 ppm (50 g/L) meets final SCAQMD Rule 1113 (2008).
4. Hardness: Shore D 78.
5. Volume Solids: 95 percent.
6. Flash Point: Greater than 200 degree F (93 degree C).
7. Sheen: Medium Gloss.
8. Mix Ratio: 1:1 (A:B) by volume.
9. Pot Life: 30 minutes at 70 degree F (21 degree C), 50 percent RH.
10. Dry Time at 70 degree F (21 degree C), 50 percent RH: 6 to 8 hours recoat, 3 days full cure.
11. Film Thickness, 2 to 3 coats at 5 to 6 mils/coat: 10 to 15 mils total DFT.
12. Thinning: None required, not advised.
13. Primer: Self-priming.
14. Topcoat: Kemiko SS1202.

15. Topcoat: STA CRETE SS1500.
16. Topcoat: Kemiko SS3500.
17. Topcoat: Kemiko SS1600.
18. Topcoat: Kemiko SS3900 High Solids Polyspartic.
19. Topcoat: Kemiko SS3700.
20. Topcoat: Kemiko SS3400.
21. Topcoat: Wait 2 to 3 days before applying top-coat. Kemiko SS1600.
22. Topcoat: Wait 2 to 3 days before applying top-coat. Kemiko SS3700.
23. Topcoat: Wait 2 to 3 days before applying top-coat. Kemiko SS3400.
24. Color: Concrete Gray.

B. Self-Leveling Clear Floor Coating: 100 percent solids epoxy.
1. Product: Kemiko SS1202.
2. Type: 100 percent solids, zero VOC, water clear epoxy coating. Designed to be used with color quartz and selected aggregate.
3. USDA acceptable in food processing facilities.
4. Volume Solids: 100 percent.
5. Flash Point: Greater than 200 degree F (93 degree C).
6. Sheen: High Gloss.
7. Mix Ratio: 2:1 (A:B) by volume.
8. VOC: Calculated VOC 0 g/L.
9. Pot Life (100 gm mass): 15 to 40 minutes at 70 degree F (21 degree C) depending on cure selection.
10. Dry Time at 70 degree F (21 degree C). 50 percent RH: Recoat in 4 to 24 hours. Dry for walking traffic in 6 to 24 hours depending on selected cure rate. Full cure in 3-days.
11. Film Thickness: 8 to 100 mils (double coats with or without aggregate).
12. Thinning: None Required. Acetone for cleanup.
13. Primers: Self priming.
14. Color: Clear.
15. Available in Fast Cure Formula. Please call for more information.

C. 1202 Self Leveling Ultra Violet Resistant: 100 percent Solids epoxy.
1. Product: Kemiko SS1202 UVR Epoxy 100 percent Volume Solids.
2. Type: 100 percent solids, zero VOC, water clear epoxy coating. Designed to be used with color quartz and selected aggregate.
3. USDA acceptable in food processing facilities.
4. Volume Solids: 100 percent.
5. Flash Point: Greater than 200 degree F (93 degree C).
6. Sheen: High Gloss.
7. Mix Ratio: 2:1 (A:B) by volume.
8. VOC: Calculated VOC 0 g/L.
9. Pot Life (100 gm mass): 15 to 40 minutes at 70 degree F (21 degree C) depending on cure selection.
10. Dry Time at 70 degree F (21 degree C). 50 percent RH: Recoat in 4 to 24 hours. Dry for walking traffic in 6 to 24 hours depending on selected cure rate. Full cure in 3-days.
11. Film Thickness: 8 to 100 mils (double coats with or without aggregate).
12. Thinning: None required. Acetone for cleanup.
13. Primers: Self priming.
14. Color: Clear.
15. No Fast Cure available.

D. Water Extended Epoxy Coating:
1. Product: Kemiko SS1600.
2. Type: Two component, water extended epoxy coating, low-VOC, water cleanup, low

odor, and designed to be used as a thin film resilient primer/finish.
3. USDA acceptable in food processing facilities.
4. Volume Solids: Clear - 45 percent, Pigmented - 45 percent.
5. VOC: Clear; Max VOC 250000 ppm (250 g/L), Pigmented; Max VOC 100000 ppm (100 g/L).
6. Flash Point Greater than 200 degree F (93 degree C).
7. Sheen: Gloss.
8. Mix Ratio: Clear; 1:3 (A:B) by volume.
9. Pot Life 6 hours at 70 degree F (21 degree C), 50 percent RH.
10. Dry Time at 70 degree F (21 degree C) 50 percent RH: Recoat in a minimum of 6 hours to a maximum of 3 days, foot traffic in 18 hours. Full cure in 5 days at 60 degree F (16 degree C) and 40 percent RH. Recoat in minimum of 12 hours to a maximum of 5-days at 90 degree F (32 degree C) 30 percent RH. Recoat in a minimum of 3 hours to a maximum of 48 hours.
11. Film Thickness: 3 to 5 mils DFT.
12. Thinning: 10 to 15 percent by volume with clean water only. Water for cleanup.
13. Primers: Self priming.
14. Color: Gray.
15. Color: Whisper White.
16. Color: Light Gray.
17. Color: Beige.
18. Color: Diego Blue.
19. Color: Bernard Tan.
20. Color: Navajo White.
21. Topcoat: Kemiko SS2400 Series Polyurethane (for exterior color and gloss retention).
22. Topcoat: Kemiko SS3900 High Solids Polyaspartic.

E. 100 percent Solids High Gloss Self Leveling Epoxy Coating:
1. Product: Kemiko SS3500.
2. Type: Pigmented, two component, abrasion resistant epoxy coating with excellent adhesion to steel and concrete, and cures to a very hard resilient high-gloss film.
3. USDA acceptable in food processing facilities.
4. VOC: Maximum 50000 ppm (50 g/L).
5. Volume Solids: 100 percent.
6. Flash Point Greater than 200 degree F (93 degree C).
7. Sheen: High Gloss.
8. Mix Ratio: 2:1 (A:B) by volume.
9. Get Time: 45 minutes at 70 degree F (21 degree C). (100 gram mass).
10. Pot Life (100 gm mass): 1/2 hour.
11. Dry Time at 70 degree F (21 degree C), 50 percent RH: Recoat within 4 to 24 hours. Full cure in 5 days (chemical resistance). Recoat Time at 50 degree F (10 degree C); minimum 16 hours, maximum 72 hours. Recoat Time 70 degree F (21 degree C); minimum 8 hours, maximum 24 hours. Recoat Time 90 degree F (32 degree C); minimum 4 hours, maximum 12 hours.
12. Film Thickness: 3 to 100 mils (.08 to 2.5 mm).
13. Thinning: None required. Acetone or PCBTF for cleanup.
14. Primer: Self priming.
15. Primer: Kemiko SS1600.
16. Primer: Kemiko SS3700.
17. Color: Gray.
18. Color: Whisper White.
19. Color: Light Gray.
20. Color: Beige.
21. Color: Diego Blue.
22. Color: Bernard Tan.
23. Color: Navajo White.

24. Topcoat: Kemiko SS2400 Polyurethane (for exterior UV, color and gloss retention).
25. Topcoat: Kemiko SS3900 High Solids Polyaspartic.
26. Available in Fast Cure Formula - please call for more information.

F. WB High-Gloss Epoxy Coating.
1. Product: Kemiko SS3700.
2. Type: High-gloss, quick-dry, amine-cured, water-extended, epoxy coating.
3. Dry Film Thickness: 2 to 3 mils.
4. Volume Solids, Clear and Pigmented: 50 percent.
5. Clear: Maximum VOC: 250000 ppm (250 g/L).
6. Thinning: None required. Water for cleanup.
7. Satin; Maximum VOC: Less than 50000 ppm (50 g/L).
8. Color: Clear.
9. Color: White.
10. Color: Gray.
11. Color: Tan.
12. Color: Spanish Red.
13. Color: Light Gray.
14. Color: Beige.
15. Color: Diego Blue.
16. Color: Yellow.
17. Color: Navajo White.

G. Waterborne Low VOC Epoxy Primer/Topcoat:
1. Product: Kemiko SS3400.
2. Type: Gloss, amine cured water extended epoxy coating with excellent adhesion, abrasion resistance and low odor, designed to be used as a thin film resilient primer/topcoat.
3. VOC: Less than 5000 ppm (5 g/L).
4. Volume Solids: 52.5 percent.
5. Flash Point Greater than 200 degree F (93 degree C) for clear & pigmented.
6. Mix Ratio: 1:2 (A:B) by volume.
7. Pot Life (100 gm mass): 1 hour at 70 degree F / 50 percent RH.
8. Dry Time at 70 degree F (21 degree C), 50 percent RH: Recoat in minimum of 8 hours to maximum of 5 days. Dry foot traffic in 16 hours. Open for heavy traffic in 24 hours. Full cure in 7 days.
9. Film Thickness and Coverage2 to 4 mils DFT. 250 to 300 square foot per gallon per coat.
10. Thinning: Product must be thinned 15 percent maximum with clean water before applying. Use water for cleanup.
11. Primer: Self priming.
12. Topcoat: Kemiko SS1202 Self Leveling Clear Floor Coating.
13. Topcoat: Kemiko SS1600 Water Extended Epoxy Coating.
14. Topcoat: Kemiko SS3700 WB high-gloss epoxy coating.
15. Topcoat: Kemiko SS3400 Universal Epoxy Coating.
16. Topcoat: Kemiko SS2400 Polyurethane (for exterior UV, color and gloss retention).
17. Topcoat: Kemiko SS3900 High Solids Polyaspartic

H. Commercial And Show Aquaria Coating:
1. Product: Kemiko (Sta Crete) SS1500.
2. Volume Solids: 100 percent.
3. VOC: 0 g/L.
4. Flash Point: Greater than 200 degree F.
5. Dry Time: At 70 degree F, 50 percent RH: recoat in 4 to 24 hours; full cure in 3 days.
6. Film Thickness: 4 to 8 mils per coat, 12 to 16 mils total DFT.
7. Thinning: None required. Contact Epmar for details. Acetone or PCBTF for cleanup.

8. Primers: Self priming.
9. Colors: Various - see color chart.
10. Topcoat: None required.

I. UV Coating Floors or Countertops:
1. UV Cure primer 100 percent solids 0008-2 single component.
2. UV Cure top coat 100 percent solids 0007-2 single component.
3. UV Cure satin finish 40 percent solids 1002 water base single component.
4. UV machine needed to cure system.
5. Call manufacturer for more information on this system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION FOR CONCRETE SUBSTRATES

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Protection: Protect walls and surrounding surfaces not to receive finish.

D. Concrete shall be as specified in Section 03 30 00 - Cast-in-Place Concrete. Verify concrete is a minimum of 28 days old.

E. Confirm that concrete surface is clean, dry, structurally sound, and free from dirt, dust, oil, grease, solvents, paint, wax, asphalt, concrete curing compounds, sealing compounds, surface hardeners, bond breakers, adhesive residue, and other surface contaminants.

F. Do not acid wash or use heavy alkali cleaners.

3.3 CLEANING OF CONCRETE SUBSTRATES

A. Bare Concrete: Apply water base cleaner to substrate and let stand for 2 to 3 minutes. Work into surface with brooms, brushes or floor scrubbing machines. Do not allow cleaner to dry on floor. Rinse with clean water and repeat cleaning operation until substrate is free of contaminants. Substrate shall be allowed to dry thoroughly prior to coating application.

B. Existing Coatings/Sealers: Apply water base cleaner to substrate and let stand for 5 to 10 minutes. Do not allow cleaner to dry on floor. Rinse with clean water and repeat cleaning operation until substrate is free of contaminants. Substrate shall be allowed to dry thoroughly prior to coating application. Stripping of acrylic sealers may result from cleaning operation. Test compatibility with existing sealers if scheduled to remain.

C. Reduction:
1. Light Duty: 1 part Kemiko Neutra Clean to 10 part water.
2. Medium Duty: 1 part Kemiko Neutra Clean to 5 part water.
3. Heavy Duty: 1 part Kemiko Neutra Clean to 2 part water.

3.4 STAIN APPLICATION TO CONCRETE SUBSTRATES

A. Apply concrete floor stain in accordance with manufacturer's instructions at locations indicated on the drawings.

B. Control depth of color by adjusting volume of stain applied to floor.

C. Apply 2 applications of concrete floor stain. Allow floor to completely dry after each application. Do not scrub clean between applications.

D. After floor has completely dried, scrub off stain residue in accordance with manufacturer's instructions. Allow floor to completely dry.

E. Keep material containers closed when not in use to avoid contamination.

3.5 POLYMER STAIN APPLICATION TO CONCRETE SUBSTRATES

A. Apply polymer stain in accordance with manufacturer's instructions at locations indicated on the drawings.

B. Concrete, Plaster, and Polymer Cement Substrate:
   1. Remove dirt, dust, oil, grease, and other surface contaminants before abrasive surface preparation, acid etching, and water washing.
   2. Confirm surfaces are cured, dry, and free from alkali stain and laitance.
   3. Verify concrete is a minimum of 28 days old.

C. Wood Substrate: Ensure surfaces are clean, dry, and free from mildew, organic matter, and surface contaminants.

D. Apply polymer stain as a stain finish.

E. Apply polymer stain as a wash finish.

F. Apply polymer stain as a faux finish.

G. Do not add thinners or dilute polymer stain.

H. Keep material containers closed when not in use to avoid contamination.

I. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.

J. Apply polymer stain to be free of film characteristics and defects that would adversely affect performance or appearance.

K. Apply clear topcoat over polymer stain in accordance with manufacturer's instructions.

3.6 FLOOR SEALER APPLICATION FOR CONCRETE SUBSTRATES

A. Apply sealer in accordance with manufacturer's instructions at locations indicated on the drawings.

B. Do not dilute sealer.

C. Apply sealer in a thin uniform film.

D. Apply second coat of sealer if required by manufacturer's instructions. Apply second coat after first coat is dry.

E. Keep sealer film build-up to a minimum.

F. Keep material containers closed when not in use to avoid contamination.

3.7 CLEAR PENETRANT APPLICATION FOR CONCRETE SUBSTRATES

A. Surface Preparation; Concrete: All visible oil, grease, sludge, stain residue and any other contaminants shall be removed prior to any Kemiko Repels application. Surface shall be cured, dry and free from alkali stain and laitance. Mask all glass and metal surfaces. These surfaces must be protected from contact with this product.

B. Apply between 50 degree F and 100 degree F (10 degrees C and 38 degrees C) with temperature 5 degree above dew point. Do not store in direct sunlight. Protect from freezing. Do not apply if rain is forecast within 24-hours of application. Do not apply to asphalt, glazed brick or glazed tile. Do not apply to wet or frosted surfaces.

3.8 FLOOR WAX APPLICATION FOR CONCRETE SUBSTRATES

A. Apply and buff wax in accordance with manufacturer's instructions at locations indicated on the drawings.

B. Keep material containers closed when not in use to avoid contamination.

3.9 UV CURED FLOOR FINISH APPLICATION FOR CONCRETE SUBSTRATES

A. Preparation: Completely remove any existing coating.

B. Environment: The minimum floor application temperature color shall be 23 degrees F (minus 5 degrees C) and 3 degrees above dew point. Optimum application temperature is 68 degrees F (20 degrees C). Maximum relative humidity is 85 percent.

C. Concrete Substrates: Prepare according to ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   3. Moisture Testing:
      a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sf (.015 kg/sm) in 24 hours.
         1) Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

D. Application: With the floor ground and shot blasted apply the product to required thickness by either roller or squeegee. The product shall be cured using a driven UV Floor Curing Lamp that cures the coating instantly.

E. Color Coat: Colors shall only be applied directly to a clear coat of the product (applied as a primer/sealer) or to the high build sealer for purposes such as demarcation lines, designation of safety areas, truck traffic ways and walkways.
   1. Application Rate: 2.5 mils to 3.5 mils (.06 mm to .09 mm) per coat.
   2. Multiple coats shall be applied to obtain the required opacity.
   3. A clear top coat shall be applied over the color coats to provide optimum cleaning and durability.

3.10 POLYASPARTIC COATING APPLICATION

A. Apply coating in accordance with manufacturer's instructions at locations indicated on the drawings.

B. Concrete:

1. Remove dirt, dust, oil, grease, and other surface contaminants before abrasive surface preparation, acid etching, and water washing.
2. Ensure surfaces are cured, dry, and free from alkali stain and laitance.
3. Blas-Trac, SSPC-SP7 Brush-Off Blast Cleaning or other approved mechanical method to achieve a 60 to 80 grit profile for long term adhesion.

C. Mix components in accordance with manufacturer's instructions.

D. Keep material containers closed when not in use to avoid contamination.

E. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.

F. Environment: Applied at substrate and environmental temperatures as low as 30 degree F (minus 1 degree C) and as high as 100 degree F (38 degree C) and 5 degree above dew point providing the material temperature is maintained at 60 degree F to 80 degree F (16 degree C to 27 degree C) depending on application method.

G. Uniformly apply coating at spreading rate required to achieve specified dry film thickness.

H. Apply coating to be free of film characteristics and defects that would adversely affect performance or appearance.

3.11 POLYURETHANE COATING APPLICATION

A. Apply polyurethane coating in accordance with manufacturer's instructions at locations indicated on the drawings.

B. Concrete:
1. Remove dirt, dust, oil, grease, and other surface contaminants before abrasive surface preparation, acid etching, and water washing.
2. Ensure surfaces are cured, dry, and free from alkali stain and laitance.
3. Blas-Trac or other approved mechanical method to achieve a 60 to 80 grit profile for long term adhesion and non-slip surface on floors.
4. Ensure concrete is a minimum of 28 days old.

C. Wood: Ensure surfaces are clean, dry, and free from mildew, organic matter, and surface contaminants.

D. Existing Coatings: Remove dirt, dust, oil, grease, chalk, loose coatings, and other deleterious matter in accordance with manufacturer's instructions. Spot prime surfaces as required.

E. Mix components and thin in accordance with manufacturer's instructions. Do not use mixed materials beyond pot life limits. Keep material containers closed when not in use to avoid contamination.

F. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.

G. Environment: Apply between 60 degrees F (16 degree C) and 100 degrees F (38 degree C) and 5 degrees above dew point.

H. Apply primer in accordance with manufacturer's instructions.

I. Uniformly apply polyurethane coating at spreading rate required to achieve specified dry film thickness.

J. Apply polyurethane coating to be free of film characteristics and defects that would adversely affect performance or appearance.

3.12 EPOXY COATING APPLICATION

A. Concrete and Masonry Surface Preparation:
   1. All visible oil, grease, sludge, and any other contaminants shall be removed prior to any abrasive surface preparation and water washing.
   2. Surface shall be cured, dry and free from alkali stain and laitance.
   3. Prepare surfaces in accordance with SSPC-SP7 Brush-Off Blast Cleaning, Blas-Trac or other approved mechanical method to achieve a 60 to 80 grit profile for long term adhesion and non-slip surface on floors.
   4. Repair all cracks, holes, and grout joints in an approved manner.

B. Wood Surface Preparation: Ensure surfaces are clean, dry, and free from mildew, organic matter, and surface contaminants.

C. Existing Coatings Surface Preparation: Remove dirt, dust, oil, grease, chalk, loose coatings, and other deleterious matter in accordance with manufacturer's instructions. Spot prime surfaces as required.

D. Environment: Apply between 60 degrees F (16 degree C) and 100 degrees F (38 degree C) and 5 degrees above dew point.

E. Wall and Surface Wetting: In advance of the coating application to help allow for absorption of the applied material, spray water onto the surface to slightly dampen using a Hudson type sprayer.

F. Apply epoxy coating in accordance with manufacturer's instructions at locations indicated on the drawings.

G. Mix components and thin in accordance with manufacturer's instructions. Do not use mixed materials beyond pot life limits. Keep material containers closed when not in use to avoid contamination.

H. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.

I. Uniformly apply epoxy coating at spreading rate required to achieve specified dry film thickness.

J. Apply epoxy coating to be free of film characteristics and defects that would adversely affect performance or appearance.

3.13 PROTECTION

A. Protect finishes from damage during construction.

B. Protect concrete surfaces from foot traffic for a minimum of 24 hours. Avoid washing concrete surfaces for a minimum of 48 hours.

C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 03 39 00
CURING, SEALING, AND HARDENING CONCRETE FLOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single application cure-seal-hardener for new concrete floors.

B. Single application sealer-hardener for existing concrete floors.

C. Precautions for avoiding staining concrete before and after application.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Material requirements for concrete to which cure-seal-hardener is to be applied, including cement type, water-cement ratio, type of trowel finish, limitations on admixtures, pigments, bonding agents, and bond breakers, etc.

C. Product Data: Manufacturer's data sheets, including product specifications, test data, preparation instructions and recommendations, storage and handling requirements and recommendations, and installation methods.

D. Maintenance instructions, including precautions for avoiding staining after application.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Applicator experienced with installation of product and certified by manufacturer, or applicator experienced with similar products and providing manufacturer's field technician on site to advise on application procedures; and providing adequate number of skilled workers trained and familiar with application requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver product in factory numbered and sealed drums, with numbers recorded for Owner's records.

B. Store products in manufacturer's unopened drums until ready for installation.

1.6 PROJECT CONDITIONS

A. No satisfactory procedures are available to remove petroleum or rust stains from concrete. Prevention is therefore essential. Take precautions to prevent staining of concrete prior to application of cure-seal-hardener and for minimum of three months after application:
   1. Prohibit parking of vehicles on concrete slab.
   2. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.
   3. If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid, or other liquids.
   4. Prohibit pipe cutting using pipe cutting machinery on concrete slab.

5. Prohibit temporary placement and storage of steel members on concrete slab.

B. Do not install products under environmental conditions outside manufacturer's absolute limits.

C. Do not use frozen material; thaw and agitate prior to use.

1.7 WARRANTY

A. Provide manufacturer's warranty that a structurally sound concrete surface prepared and treated according to the manufacturer's directions will remain permanently dustproof, hardened and water repellent. If after the specified sealing period the treated surface does not remain dustproof, hardened and water repellent, provide, at manufacturer's expense, sufficient material to reseal defective areas.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Ashford Formula, By Curecrete, which is located at: 1203 Spring Creek Pl.; Springville, UT 84663; Toll Free Tel: 800-998-5664; Tel: 801-489-5663; Fax: 801-489-3307; Email:request info (sales@ashfordformula.com); Web:https://ashfordformula.com|http://retroplatesystem.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 MATERIALS

A. Cure-Seal-Hardener: Ashford Formula; water-based chemically-reactive penetrating sealer and hardener, that seals by densifying concrete so that water molecules cannot pass through but air and water vapor can, while allowing concrete to achieve full compressive strength, minimizing surface crazing, and eliminating dusting.
   1. Colorless, transparent, odorless, non-toxic, non-flammable.
   2. Containing no solvents or volatile organic compounds.
   3. USDA approved for food handling facilities.
   4. Allowing traffic on floors within 2 to 3 hours, with chemical process complete within 3 months.
   5. No change to surface appearance except a sheen developed due to traffic and cleaning.

B. Water: Clean, potable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared and are suitable for application of product.

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 surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. If this is the applicator's first project using this product, provide the manufacturer's technical representative on-site to familiarize installers with proper procedures.

C. Prevent damage to and soiling of adjacent work.

D. New Concrete: Apply cure-seal-hardener to new concrete as soon as the concrete is firm enough to work on after troweling, except on colored concrete wait minimum of 30 days.
   1. Spray on at rate of 200 square feet per gallon (4.8 sq m/L).
   2. Keep surfaces wet with cure-seal-hardener for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather slipperiness may appear before the 30 minute time period has elapsed. If that occurs, apply more cure-seal-hardener as required to keep entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state.
   3. After this period, when treated surface becomes slippery lightly mist with water until slipperiness disappears.
   4. Wait for surface to become slippery again and then flush entire surface with water removing all residue of cure-seal-hardener.
   5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
   6. Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.

E. Existing Concrete: Apply cure-seal-hardener only to clean bare concrete.
   1. Thoroughly remove previous treatments, laitance, oil, and other contaminants.
   2. Saturate surface with cure-seal-hardener; respray or broom excess onto dry spots.
   3. Keep surface wet with cure-seal-hardener for minimum soak-in period of 30 to 40 minutes.
   4. If, after the 30 minute soak-in period, most of the material has been absorbed, remove all excess material using broom or squeegee, especially from low spots.
   5. If, after the 30 minute soak-in period, most of the material remains on the surface, wait until it becomes slippery and then flush entire surface with water removing all residue of cure-seal-hardener and squeegee completely dry, flushing any remaining slippery areas until no residue remains.
   6. If water is not available, remove residue using squeegee.

3.4 PROTECTION

A. Protect installed floors until chemical reaction process is complete; at least three months.
   1. Comply with precautions listed under PROJECT CONDITIONS.
   2. Clean floor regularly in accordance with manufacturer's recommendations because water will accelerate the sealing and scrubbing will impart a shine.
   3. Clean up spills immediately and spot-treat stains with good degreaser or oil emulsifier.

B. Precautions and cleaning are the responsibility of the General Contractor until Sub stantial Completion.

END OF SECTION

SECTION 03 54 00
FLOOR UNDERLAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gypsum Floor Underlayment.

B. Gypsum Pourable Thermal Underlayment.

C. Gypsum Underlayment for Corrugated Steel Deck Construction.

D. Cementitious self-leveling floor underlayment.

E. Cementitious self-leveling wearing surface.

F. Cementitious patching compound.

G. Cementitious lightweight aggregate fill.

1.2 RELATED SECTIONS

A. Section 03 54 00 - Cast Underlayment0 - Cast Underlayment

B. Section - 0 - Expansion Joint Cover Assemblies.

C. Section 09 30 00 - Tiling.

D. Section 09 60 00 - Flooring.

E. Section 09 67 13.33 - Conductive Elastomeric Liquid Flooring.

F. Section 09 80 00 - Acoustic Treatment.

1.3 REFERENCES

A. International Code Council (ICC): ICC-ES ESR-2540; Gyp-Crete; Gyp-Crete 2000/3.2K; Therma-Floor; Dura-Cap; Commercial Topping; Level-Right Product.

B. ASTM International (ASTM):
1. ASTM C 109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
2. ASTM C 190 - Method of Test for Tensile Strength of Hydraulic Cement Mortars.
3. ASTM C 348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
4. ASTM C 472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.
5. ASTM C 882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear; Level-Right FS-10 only.
6. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
8. ASTM F 2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slab.
9. ASTM F 2419 - Standard Practice for Installation of Thick Poured Gypsum Concrete Underlayments and Preparation of the Surface to Receive Resilient Flooring.

10. ASTM F 2678 - Standard Practice for Preparing Panel Underlayments, Thick Poured Gypsum Concrete Underlayments, Thick Poured Lightweight Cellular Concrete Underlayments, and Concrete Subfloors with Underlayment Patching Compounds to Receive Resilient Flooring.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Data substantiating compliance with specified physical properties.
2. Storage and handling requirements and recommendations.
3. Surface preparation instructions and recommendations.
4. Details of terminations and interfaces with other materials.
5. Installation requirements and methods.

C. Installer's Qualifications: Submit in writing by Maxxon Corporation that installer is a manufacturer-authorized applicator.

1.5 QUALITY ASSURANCE

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

B. Applicator Qualifications: Authorized by manufacturer, using manufacturer approved mixing and pumping equipment.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered in their original, unopened packages, and protected from exposure to the elements.

B. Damaged or deteriorated materials shall be removed from the premises.

C. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Maxxon Corp. , which is located at: 920 Hamel Rd. P. O. Box 253; Hamel, MN 55340; Toll Free Tel: 800-356-7887; Tel: 763-478-9600; Fax: 763-478-2431; Email:request info (Tcrooker@maxxon.com); Web:http://www.maxxoncorporation.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Gypsum Floor Underlayment: Gyp-Crete Floor Underlayment.
1. Material: Gypsum Underlayment.
2. Dry Density: Approximately 110 pcf (1760 kg/cu.m).

3. Compressive Strength, per ASTM C472, at 28 days: 2200 psi (15 MPa).
4. Surface Burning Characteristics, per ASTM E 84:
    a. Flame Spread: 0.
    b. Fuel Contribution: 0.
    c. Smoke Development: 0.
5. ICC-ES Listing: ESR-2540.
6. GREENGUARD Standards: GREENGUARD Gold Certified.
7. Primer: Maxxon Floor Primer.
8. Sealer: Maxxon Overspray.
9. Sand Aggregate:
    a. Material: Washed masonry or plaster sand.
    b. Particle Size: 1/8 inch (3.2 mm) or less.
    c. Maxxon Sand Specifications 101.
10. USGBC LEED Credit Contribution:
    a. MR Credit 3: Building Product Disclosure and Optimization - Sourcing Raw Materials.
    b. EQ Credit 2: Low Emitting Materials.
    c. EQ Credit 4: Indoor Air Quality Assessment.
    d. EQ Credit 9: Acoustic Performance.
    e. Contact Maxxon Corporation for specific details.

B. Gypsum Floor Underlayment: Gyp-Crete 2000/3.2K Floor Underlayment.
1. Material: Gypsum Underlayment .
2. Dry Density: Approximately 115 pcf (1840 kg/cu.m).
3. Compressive Strength, per ASTM C472, at 28 days: up to 3200 psi (22 MPa).
4. Surface Burning Characteristics, per ASTM E 84:
    a. Flame Spread: 0.
    b. Fuel Contribution: 0.
    c. Smoke Development: 0.
5. ICC-ES Listing: ESR-2540.
6. GREENGUARD Standards: GREENGUARD Gold Certified.
7. Primer: Maxxon Floor Primer.
8. Sealer: Maxxon Overspray.
9. Sand Aggregate:
    a. Material: Washed masonry or plaster sand.
    b. Particle Size: 1/8 inch (3.2 mm) or less.
    c. Maxxon Sand Specifications 101.
10. USGBC LEED Credit Contribution:
    a. MR Credit 3: Building Product Disclosure and Optimization - Sourcing Raw Materials.
    b. EQ Credit 2: Low Emitting Materials.
    c. EQ Credit 4: Indoor Air Quality Assessment.
    d. EQ Credit 9: Acoustic Performance.
    e. Contact Maxxon Corporation for specific details.

C. Gypsum Floor Underlayment: Therma-Floor Floor Underlayment.
1. Material: Gypsum Underlayment.
2. Dry Density: Approximately 115 pcf (1840 kg/cu.m).
3. Compressive Strength, per ASTM C472, at 28 days: up to 3000 psi (21 MPa).
4. Surface Burning Characteristics, per ASTM E 84:
    a. Flame Spread: 0.
    b. Fuel Contribution: 0.
    c. Smoke Development: 0.
5. ICC-ES Listing: ESR-2540.
6. GREENGUARD Standards: GREENGUARD Gold Certified.
7. Primer: Maxxon Floor Primer.
8. Sealer: Maxxon Overspray.
9. Sand Aggregate:
    a. Material: Washed masonry or plaster sand.

b. Particle Size: 1/8 inch (3.2 mm) or less.
c. Maxxon Sand Specifications 101.

10. USGBC LEED Credit Contribution:
    a. MR Credit 3: Building Product Disclosure and Optimization - Sourcing Raw Materials.
    b. EQ Credit 2: Low Emitting Materials.
    c. EQ Credit 4: Indoor Air Quality Assessment.
    d. EQ Credit 9: Acoustic Performance.
    e. Contact Maxxon Corporation for specific details.

D. Gypsum Floor Underlayment: Dura-Cap Floor Underlayment.
1. Material: Gypsum Underlayment.
2. Dry Density: Approximately 115 pcf (1840 kg/cu.m).
3. Compressive Strength, per ASTM C472, at 28 days: 4000 psi (28 MPa).
4. Surface Burning Characteristics, per ASTM E 84:
    a. Flame Spread: 0.
    b. Fuel Contribution: 0.
    c. Smoke Development: 0.
5. ICC-ES Listing: ESR-2540.
6. GREENGUARD Standards: GREENGUARD Gold Certified.
7. Primer: Maxxon Floor Primer.
8. Sealer: Maxxon Overspray.
9. Sand Aggregate:
    a. Material: Washed masonry or plaster sand.
    b. Particle Size: 1/8 inch (3.2 mm) or less.
    c. Maxxon Sand Specifications 101.
10. USGBC LEED Credit Contribution:
    a. MR Credit 3: Building Product Disclosure and Optimization - Sourcing Raw Materials.
    b. EQ Credit 2: Low Emitting Materials.
    c. EQ Credit 4: Indoor Air Quality Assessment.
    d. EQ Credit 9: Acoustic Performance.
    e. Contact Maxxon Corporation for specific details.

E. Gypsum Floor Underlayment: Commercial Topping Floor Underlayment.
1. Material: Gypsum Underlayment.
2. Dry Density: Approximately 125 pcf (2000 kg/cu.m).
3. Compressive Strength, per ASTM C472, at 28 days: up to 4500 psi (31 MPa).
4. Flexural Strength: Tensile Strength, per ASTM C 348, at 28 days: 1660 psi (11.4 MPa).
5. Tensile Strength, per ASTM C 190, at 28 days: 515 psi (3.5 MPa).
6. Surface Burning Characteristics, per ASTM E 84:
    a. Flame Spread: 0.
    b. Fuel Contribution: 0.
    c. Smoke Development: 0.
7. ICC-ES Listing: ESR-2540.
8. GREENGUARD Standards: GREENGUARD Gold Certified.
9. Primer: Maxxon Floor Primer.
10. Sealer: Maxxon Overspray.
11. Sand Aggregate:
    a. Material: Washed masonry or plaster sand.
    b. Particle Size: 1/8 inch (3.2 mm) or less.
    c. Maxxon Sand Specifications 101.
12. USGBC LEED Credit Contribution:
    a. MR Credit 3: Building Product Disclosure and Optimization - Sourcing Raw Materials.
    b. EQ Credit 2: Low Emitting Materials.
    c. EQ Credit 4: Indoor Air Quality Assessment.
    d. EQ Credit 9: Acoustic Performance.

e. Contact Maxxon Corporation for specific details.

F. Cementitious Underlayment, Maxxon Level-Right System.
1. Material: Hydraulic cement.
2. Dry Density: Approximately 125 pcf (2003 kg/cu.m).
3. Compressive Strength, per modified ASTM C 109M, at 28 days: 5500 psi (38 MPa).
4. Flexural Strength: ASTM C 348, at 28 days: 1260 psi (8.7 MPa).
5. Tensile Strength, per ASTM C 190, at 28 days: 720 psi (5 MPa).
6. Surface Burning Characteristics, per ASTM E 84:
   a. Flame Spread: 0.
   b. Fuel Contribution: 0.
   c. Smoke Development: 0.
7. ICC-ES Listing: ESR-2540.
8. GREENGUARD Standards: GREENGUARD Gold Certified.
9. Concrete Primer: Maxxon Floor Primer.
10. Sealer: Maxxon Overspray.
11. Sand Aggregate:
    a. Material: Washed masonry or plaster sand.
    b. Particle Size: 1/8 inch (3.2 mm) or less.
    c. Maxxon Sand Specifications 101.
12. USGBC LEED Credit Contribution:
    a. MR Credit 3: Building Product Disclosure and Optimization - Sourcing Raw Materials.
    b. EQ Credit 2: Low Emitting Materials.
    c. EQ Credit 4: Indoor Air Quality Assessment.
    d. EQ Credit 9: Acoustic Performance.
    e. Contact Maxxon Corporation for specific details.

G. Cementitious Underlayment, Maxxon Level-One EZ System.
1. Material: Polymer Modified Cementitious Underlayment
2. Compressive Strength, per modified ASTM C 109M, at 28 days: 4500 psi (31.0 MPa).
3. Flexural Strength: ASTM C 348, at 28 days: 1000 psi (6.9 MPa).
4. Concrete Primer: Maxxon Acrylic or Aquafin SLU Primer.
5. Sand Aggregate:
   a. Material: Washed masonry or plaster sand.
   b. Particle Size: 1/8 inch (3.2 mm) or less.
   c. Maxxon Sand Specifications 101.

H. Lightweight Fill: Maxxon Level-Right LDF.
1. Function: Low density fill for deep fill applications.
2. Material: Polymer modified Portland cement and a proprietary expanded polystyrene foam aggregate.
3. Dry Density: Approximately 28-32 lbs/ft3 (449-513 kg/m3).
4. Compressive Strength, per ASTM C 109: up to 400 psi (2.8 MPa).
5. Flexural Strength per ASTM C 78: 119 psi (10 MPa).
6. Modulus of Elasticity, per ASTM C 649: 1.1 GPa.
7. Freeze/Thaw per ASTM C 666: No loss at 300 cycles.
8. R-value: 1.8 per inch.
9. USGBC LEED Credit Contribution:
   a. MR Credit 3: Building Product Disclosure and Optimization - Sourcing Raw Materials.
   b. EQ Credit 2: Low Emitting Materials.
   c. EQ Credit 4: Indoor Air Quality Assessment.
   d. EQ Credit 9: Acoustic Performance.
   e. Contact Maxxon Corporation for specific details.

I. Mix Designs: Mix proportions and methods shall be in strict accordance with product manufacturer recommendations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been 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 surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Concrete shall be structurally sound and free of mud, oil, grease, and other contaminating factors. Shot blast or scarify as required by manufacturer.

D. Fill cracks and voids with a quick setting patching or caulking material where leakage of topping could occur.

E. Prime concrete using the manufacturer approved primer in accordance with manufacturer's instructions according to the porosity of the concrete. Provide multiple coats if necessary.

F. Allow joints to continue through the underlayment at the same width,

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Application shall not begin until the building is enclosed, including roof, windows, doors, and other fenestration. Install after drywall installation unless tenant finish requirements identify partitioning after the pour.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Protection from Heavy Loads: During construction, place temporary wood planking over toppings wherever they will be subject to heavy wheeled or concentrated loads.

C. Touch-up, repair or replace damaged products before Substantial Completion

END OF SECTION

DIVISION 4 – MASONRY

SECTION 04 22 00
CONCRETE MASONRY UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete Masonry Units:
   1. Castle Rock Block.
   2. Heritage Collection Designer Concrete Brick.
   3. Premier Ultra Burnished Masonry Units.
   4. Scored Smooth Block.
   5. Shadow Stone Block.
   6. Splitface Block.
   7. Transplit Block.
   8. Wirecut Block.

B. Concrete Face Brick:
   1. Heritage Collection Designer Concrete Brick.
   2. Reflection Brick.

C. Concrete Masonry Veneer Units:
   1. County Stone.
   2. Reflection Stone.
   3. Reflection Stone GRAND.

D. Concrete Thin Veneers:
   1. County Stone.
   2. Heritage Collection Designer Concrete Brick.
   3. Premier Ultra Burnished Masonry Units.
   4. Reflection Stone.
   5. Reflection Stone GRAND
   6. Reflection Brick.
   7. Splitface Block.

E. Mortar, reinforcement, anchorages, and accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 03 45 13 - Faced Architectural Precast Concrete.

C. Section 04 05 16.16 - Chemical-Resistant Masonry Grouting.

D. Section 04 05 19.13 - Continuous Joint Reinforcing.

E. Section 04 27 23 - Cavity Wall Unit Masonry.

F. Section 04 22 00.14 - Concrete Thin Veneers.

G. Section 07 60 00 - Flashing and Sheet Metal.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM A 82 / A 82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   2. ASTM A 153 - Standard Specification for Zinc-Coated (Hot Dip) on Iron and Steel Hardware.
   3. ASTM A 496 / A 496M - Standard Specification Steel Wire, Deformed, for Concrete Reinforcement.
   4. ASTM A 641 / A 641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   5. ASTM A 951 / A 951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
   6. ASTM C 1634 - Standard Specification for Concrete Facing Brick.
   7. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
   8. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units.
   9. ASTM C 91 - Standard Specification for Masonry Cement.
   10. ASTM C 140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
   11. ASTM C 143 / C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
   12. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
   13. ASTM C 150 - Standard Specification for Portland Cement.
   14. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
   15. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
   16. ASTM C 476 - Standard Specification for Grout for Masonry.
   17. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
   18. ASTM C 1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
   19. ASTM C 1634 - Standard Specification for Concrete Facing Brick.
   20. ASTM D 2240 - Standard Test Method for Rubber Property - Durometer Hardness.
   21. ASTM E 488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.

B. International Building Code (IBC).
   1. IBC - Chapter 7 Fire-Resistance-Rated Construction 721.3 Concrete Masonry.
   2. IBC - Chapter 21 Masonry.

C. Masonry Standards Joint Committee (MSJC):
   1. Building Code Requirements for Masonry Structures.
   2. Specifications for Masonry Structures.

D. Masonry Veneer Manufacturers Association (MVMA): Installation Guide for Adhered Masonry Veneer.

E. Precast/Prestressed Concrete Institute (PCI): MNL-122 - Architectural Precast Concrete.

F. National Concrete Masonry Association (NCMA):
   1. TEK Manual for Concrete Masonry Design and Construction.

G. American Concrete Institute (ACI): ACI 117- Specification for Tolerances for Concrete Construction and Materials.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.

2. Installation methods.
3. Cleaning and maintenance instructions provided by cleaning or another agent manufacturer.

C. Shop Drawings: Provide shop drawings indicating details of construction, control joints and installation requirements.

D. Certificates: Letter of compliance to specified performance requirements.

E. Test Reports: Submit manufacturer's Material Test Report (ASTM C140).
1. Dimensional Analysis.
2. Absorption Analysis.
3. Compressive Strength Analysis.
a. Selection Samples: Submit two sets of samples showing all available colors, patterns, textures, and finishes.

F. Verification Samples: For each product specified, two samples, representing types, colors, textures, and finishes to be installed.

G. USGBC LEED Submittals: Submit manufacturer's documentation of the following items:
1. MR Credit 4.1 and 4.2: Recycled content of products, indicating percentages of supplementary cementitious content.
2. MR Credit 5.1 and 5.2: For projects within 500 miles of manufacturing location where materials are extracted, processed and manufactured.

1.5 QUALITY ASSURANCE

A. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Construct a separate (not part of the actual building) sample wall panel not less than 4 feet by 4 feet (1.2 m x 1.2 m) with units in the pattern, type, color, texture, finish and shape as indicated on Drawings and specifications. Water repellent in mortar, cleaning agents, sealing agents if applicable, and methods shall be performed prior to approval of the sample panel.
2. Do not proceed with remaining work until workmanship, patterns, types, colors, textures, finishes, shape, application methods for water repellent in mortar, cleaning agents and sealing agents if applicable are approved by Architect in writing. Maintain Mock-up during construction for workmanship standard.
3. Rework mock-up area as required to produce acceptable work.

B. Control Joints: Comply with requirements on the Drawings, designed to reduce restraint and permit longitudinal movement, and as recommended by NCMA Tek Note 10-2C and 10-4.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Stack cubes only one cube high. Protect from damage.

B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery: Deliver units in manufacturer's unopened, labeled, packaging. Units shall be inspected upon delivery. Defective units shall be removed immediately.

D. Storage: Store materials off the ground and keep free from groundwater, soil contamination, mud and dust. Materials shall be protected from precipitation and harmful weather conditions. Product with visible frozen moisture shall not be installed.

E. Handling: Units shall be handled in a manner that prevents breakage and damage.

1.7 PROJECT CONDITIONS

A. Temperature and Weather:
1. Protect concrete masonry units from rain and freezing temperatures prior to, during, and for 48 hours after installation of materials.
2. When ambient temperature is below 40 degrees F (4.4 degrees C) or exceeds 90 degrees F (32.2 degrees C), comply with requirements for project conditions in accordance with MSJC Specification for Masonry Structures including the following:
a. Par. 1.8 C. Cold Weather Construction.
b. Par. 1.8 D. Hot Weather Construction.
3. Do not continue masonry construction during heavy rains, as partially set or plastic mortar is susceptible to washout until 8 to 24 hours of curing occurs (depending upon environmental conditions).
4. When rain is likely, cover construction materials. Newly constructed masonry shall be protected from rain by draping a weather-resistant covering over the assembly. The cover shall be secured in place and extend over mortar that is susceptible to washout.
a. Abide by manufacturer's absolute limits for storage temperature and direct sunlight, to prevent compromising wax coating.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: County Materials Corporation, which is located at: 205 North St. P. O. Box 100; Marathon, WI 54448-0100; Toll Free Tel: 800-242-7733; Tel: 715-848-1365; Fax: 715-443-3691; Email:request info (info@countymaterials.com); Web:www.countymaterials.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 CONCRETE MASONRY UNITS

A. Basis of Design: Castle Rock Block as manufactured by County Materials Corporation.
1. Description: Normal weight, integrally pigmented loadbearing hollow units with a net area compressive strength of greater than or equal to 2000 psi.
2. Compliance: ASTM C 90.
3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
4. Water Repellent: Integral Water Repellent.
5. Shape: Stretcher:
a. Nominal Width: 8 inches.
b. Nominal Width: 12 inches.
6. Shape: Flush End/ Sash/ Spiltable:
a. Nominal Width: 8 inches.
b. Nominal Width: 12 inches.
7. Shape: Bond Beam:
a. Nominal Width: 8 inches.
b. Nominal Width: 12 inches.
8. Shape: Double Flush End:
a. Nominal Width: 4 inches.
b. Nominal Width: 8 inches.
c. Nominal Width: 12 inches.
9. Shape: All Solid:
a. Nominal Width: 4 inches.

10. Color: As selected from manufacturer's standard range.
11. Color: As indicated on the Drawings.
12. Color: _____.

B. Basis of Design: Heritage Collection Designer Concrete Brick as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented solid units with a net area compressive strength of greater than or equal to 2000 psi.
   2. Compliance: ASTM C 90.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Water Repellent: Integral Water Repellent.
   5. Facing Texture Style:
      a. Smooth.
      b. Splitface.
      c. Rough Estate.
      d. Tumbled.
   6. Size and Shape:
      a. 4x4x16: 3-5/8 x 3-5/8 x 15-5/8 inches.
      b. 6x4x16: 5-5/8 x 3-5/8 x 15-5/8 inches.
      c. 8x4x16: 7-5/8 x 3-5/8 x 15-5/8 inches.
      d. 10x4x16: 9-5/8 x 3-5/8 x 15-5/8 inches.
      e. 12x4x16: 11-5/8 x 3-5/8 x 15-5/8 inches.
      f. Half High Bond Beam: 7-5/8 x 3-5/8 x 15-5/8 inches.
      g. Half High Bond Beam: 9-5/8 x 3-5/8 x 15-5/8 inches.
      h. Half High Bond Beam: 11-5/8 x 3-5/8 x 15-5/8 inches.
   7. Style: Blended.
      a. Color: As selected from manufacturer's standard range.
      b. Color: As indicated on the Drawings.
      c. Color: _____.
   8. Style: No Flash.
      a. Color: As selected from manufacturer's standard range.
      b. Color: As indicated on the Drawings.
      c. Color: _____.

C. Basis of Design: Premier Ultra Burnished Masonry Units as manufactured by County Materials Corporation.
   1. Description: Integrally pigmented loadbearing hollow units with a net area compressive strength of greater than or equal to 2000 psi.
   2. Compliance: ASTM C 90.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Water Repellent: Integral Water Repellent.
   5. Finish: Ground Face.
   6. Size and Shape: _____.
   7. Special Shapes, Finished Ends, Scores, Chamfers: As required.
      a. Corner: 4FE L: 7-5/8 x 7-5/8 x 15-5/8 inches, 3-5/8 inch thickness.
      b. Bullnose End: 8FEBN: 7-5/8 x 7-5/8 x 15-5/8 inches.
      c. Bullnose Top: BFTBN: 7-5/8 x 7-5/8 x 15-5/8 inches.
      d. Bond Beam: 8UF: 7-5/8 x 7-5/8 x 15-5/8 inches.
      e. Cap: ____.
      f. Banding: ____.
      g. Other: _____.
   8. Style: Hollow.
   9. Style: Semi Solid.
   10. Style: Solid.
   11. Color: As selected from manufacturer's standard range.
   12. Color: As indicated on the Drawings.
   13. Color: _____.

14. Scoring: None.
15. Square Scoring: V1, single score line.
16. Square Scoring: V2, two score lines.
17. Square Scoring: V3, three score lines.

D. Basis of Design: Scored Smooth Block as manufactured by County Materials Corporation.
1. Description: Normal weight, integrally pigmented loadbearing hollow units with a net area compressive strength of greater than or equal to 2000 psi.
2. Compliance: ASTM C 90.
3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
4. Water Repellent: Integral Water Repellent.
5. Shape: Stretcher:
    a. Nominal Width: 8 inches.
    b. Nominal Width: 10 inches.
    c. Nominal Width: 12 inches.
    d. Nominal Width: 14 inches.
    e. Nominal Width: 16 inches.
6. Shape: Flush End/ Sash/ Spiltable:
    a. Nominal Width: 4 inches.
    b. Nominal Width: 6 inches.
    c. Nominal Width: 8 inches.
    d. Nominal Width: 10 inches.
    e. Nominal Width: 12 inches.
    f. Nominal Width: 14 inches.
    g. Nominal Width: 16 inches.
7. Shape: Bond Beam:
    a. Nominal Width: 6 inches.
    b. Nominal Width: 8 inches.
    c. Nominal Width: 10 inches.
    d. Nominal Width: 12 inches.
    e. Nominal Width: 14 inches.
    f. Nominal Width: 16 inches.
8. Shape: Double Flush End:
    a. Nominal Width: 4 inches.
    b. Nominal Width: 6 inches.
    c. Nominal Width: 8 inches.
    d. Nominal Width: 10 inches.
    e. Nominal Width: 12 inches.
    f. Nominal Width: 14 inches.
    g. Nominal Width: 16 inches.
9. Shape: All Solid:
    a. Nominal Width: 4 inches.
10. Shape: Half Block, 8 inches long:
    a. Nominal Width: 8 inches.
    b. Nominal Width: 12 inches.
11. Shape: Half High, 4 inches high:
    a. Nominal Width: 4 inches.
    b. Nominal Width: 6 inches.
    c. Nominal Width: 8 inches.
    d. Nominal Width: 10 inches.
    e. Nominal Width: 12 inches.
12. Shape: _____.
13. Color: As selected from manufacturer's standard range.
14. Color: As indicated on the Drawings.
15. Color: _____.
16. Score Shape: 3/8 inch square score.
    a. 1 Score.

b. 3 Score.
c. 5 Score.
d. 7 Score.
e. Random Score.

17. Score Shape: 3/8 inch small V score.
    a. 1 Score.
    b. 3 Score.
    c. 5 Score.
    d. 7 Score.
    e. Random Score.
18. Score Shape: 3/8 inch round score, 1/4 inch deep.
    a. 1 Score.
19. Score Shape: 3/8 inch round score, 1/8 inch deep.
    a. 1 Score.
    b. 3 Score.
    c. 5 Score.

E. Basis of Design: Shadow Stone Block as manufactured by County Materials Corporation.
    1. Description: Normal weight, integrally pigmented loadbearing hollow units with a net area compressive strength of greater than or equal to 2000 psi.
    2. Compliance: ASTM C 90.
    3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
    4. Water Repellent: Integral Water Repellent.
    5. Shape: Stretcher:
        a. Nominal Width: 8 inches.
        b. Nominal Width: 12 inches.
    6. Shape: Flush End/ Sash/ Spiltable:
        a. Nominal Width: 8 inches.
        b. Nominal Width: 12 inches.
    7. Shape: Bond Beam:
        a. Nominal Width: 8 inches.
        b. Nominal Width: 12 inches.
    8. Shape: Double Flush End:
        a. Nominal Width: 4 inches.
    9. Shape: All Solid:
        a. Nominal Width: 4 inches.
    10. Color: As selected from manufacturer's standard range.
    11. Color: As indicated on the Drawings.
    12. Color: _____.

F. Basis of Design: Splitface/ Fullface Split/ Rockface Block as manufactured by County Materials Corporation.
    1. Description: Normal weight, integrally pigmented loadbearing hollow units with a net area compressive strength of greater than or equal to 2000 psi.
    2. Compliance: ASTM C 90.
    3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
    4. Water Repellent: Integral Water Repellent.
    5. Shape: Stretcher:
        a. Nominal Width: 8 inches.
        b. Nominal Width: 10 inches.
        c. Nominal Width: 12 inches.
        d. Nominal Width: 14 inches.
        e. Nominal Width: 16 inches.
    6. Shape: Flush End/ Sash/ Spiltable:
        a. Nominal Width: 8 inches.
        b. Nominal Width: 10 inches.
        c. Nominal Width: 12 inches.

d. Nominal Width: 14 inches.
e. Nominal Width: 16 inches.

7. Shape: Bond Beam:
   a. Nominal Width: 6 inches.
   b. Nominal Width: 8 inches.
   c. Nominal Width: 10 inches.
   d. Nominal Width: 12 inches.
   e. Nominal Width: 14 inches.
   f. Nominal Width: 16 inches.
8. Shape: Double Flush End:
   a. Nominal Width: 4 inches.
   b. Nominal Width: 6 inches.
   c. Nominal Width: 8 inches.
   d. Nominal Width: 10 inches.
   e. Nominal Width: 12 inches.
   f. Nominal Width: 14 inches.
   g. Nominal Width: 16 inches.
9. Shape: All Solid:
   a. Nominal Width: 4 inches.
10. Shape: Half Block, 8 inches long:
    a. Nominal Width: 8 inches.
    b. Nominal Width: 10 inches.
    c. Nominal Width: 12 inches.
11. Shape: Half High, 4 inches high:
    a. Nominal Width: 4 inches.
    b. Nominal Width: 6 inches.
    c. Nominal Width: 8 inches.
    d. Nominal Width: 10 inches.
    e. Nominal Width: 12 inches.
12. Shape: _____.
13. Color: As selected from manufacturer's standard range.
14. Color: As indicated on the Drawings.
15. Color: _____.
16. Score Shape: 3/8 inch square score.
    a. 1 Score.
    b. 3 Score.
    c. 5 Score.
    d. 7 Score.
17. Score Shape: 1 inch round score, 1/2 inch deep.
    a. 7 Score.
18. Score Shape: 7/8 inch deep V score.
    a. 1 Score.
    b. 3 Score.
    c. 5 Score.

G. Basis of Design: Transplit Block as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented loadbearing hollow units with a net area compressive strength of greater than or equal to 2000 psi.
   2. Compliance: ASTM C 90.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Water Repellent: Integral Water Repellent.
   5. Shape: Stretcher:
      a. Nominal Width: 8 inches.
      b. Nominal Width: 10 inches.
      c. Nominal Width: 12 inches.
   6. Shape: Flush End/ Sash/ Spiltable:
      a. Nominal Width: 8 inches.

b. Nominal Width: 10 inches.
c. Nominal Width: 12 inches.

7. Shape: Bond Beam:
   a. Nominal Width: 8 inches.
   b. Nominal Width: 10 inches.
   c. Nominal Width: 12 inches.
8. Shape: Double Flush End:
   a. Nominal Width: 4 inches.
   b. Nominal Width: 6 inches.
   c. Nominal Width: 8 inches.
   d. Nominal Width: 10 inches.
   e. Nominal Width: 12 inches.

H. Basis of Design: Wirecut/ Striated/ Combed Block as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented loadbearing hollow units with a net area compressive strength of greater than or equal to 2000 psi.
   2. Compliance: ASTM C 90.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Water Repellent: Integral Water Repellent.
   5. Shape: Stretcher:
      a. Nominal Width: 8 inches.
      b. Nominal Width: 10 inches.
      c. Nominal Width: 12 inches.
      d. Nominal Width: 14 inches.
      e. Nominal Width: 16 inches.
   6. Shape: Flush End/ Sash/ Spiltable:
      a. Nominal Width: 4 inches.
      b. Nominal Width: 6 inches.
      c. Nominal Width: 8 inches.
      d. Nominal Width: 10 inches.
      e. Nominal Width: 12 inches.
      f. Nominal Width: 14 inches.
      g. Nominal Width: 16 inches.
   7. Shape: Bond Beam:
      a. Nominal Width: 6 inches.
      b. Nominal Width: 8 inches.
      c. Nominal Width: 10 inches.
      d. Nominal Width: 12 inches.
      e. Nominal Width: 14 inches.
      f. Nominal Width: 16 inches.
   8. Shape: Double Flush End:
      a. Nominal Width: 4 inches.
      b. Nominal Width: 6 inches.
      c. Nominal Width: 8 inches.
      d. Nominal Width: 10 inches.
      e. Nominal Width: 12 inches.
      f. Nominal Width: 14 inches.
      g. Nominal Width: 16 inches.
   9. Shape: All Solid:
      a. Nominal Width: 4 inches.
      b. Nominal Width: 4 inches.
   10. Shape: Half High, 4 inches high:
      a. Nominal Width: 4 inches.
      b. Nominal Width: 6 inches.
      c. Nominal Width: 8 inches.
      d. Nominal Width: 10 inches.

e. Nominal Width: 12 inches.
11. Shape: _____.
12. Color: As selected from manufacturer's standard range.
13. Color: As indicated on the Drawings.
14. Color: _____.
15. Score Shape: 3/8 inch square score.
    a. 1 Score.
    b. 3 Score.
    c. 5 Score.
    d. 7 Score.
16. Score Shape: 3/8 inch small V score.
    a. 1 Score.
    b. 3 Score.
    c. 5 Score.
    d. 7 Score.
17. Score Shape: 3/8 inch round score.
    a. 1 Score.
    b. 3 Score.
    c. 5 Score.
    d. 7 Score.

2.3 CONCRETE FACE BRICK

A. Basis of Design: Heritage Collection Designer Concrete Brick as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented loadbearing hollow units with a net area compressive strength of greater than or equal to 3500 psi.
   2. Compliance: ASTM C 1634.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Water Repellent: Integral Water Repellent.
   5. Facing Texture Style:
      a. Smooth.
      b. Splitface.
      c. Rough Estate.
      d. Tumbled.
   6. Size and Shape:
      a. Modular Brick: 3-5/8 x 2-1/4 x 7-5/8 inches.
      b. Engineer Brick: 3-5/8 x 2-3/4 x 7-5/8 inches.
      c. King Size Brick: 3-5/8 x 3 x 9-3/4 inches.
      d. Closure Brick: 3-5/8 x 3-5/8 x 7-5/8 inches.
      e. Utility Brick: 3-5/8 x 3-5/8 x 11-5/8 inches.
      f. Load-Bearing Utility Brick: 5-5/8 x 3-5/8 x 11-5/8 inches.
   7. Style: Blended.
      a. Color: As selected from manufacturer's standard range.
      b. Color: As indicated on the Drawings.
      c. Color: _____.
   8. Style: No Flash.
      a. Color: As selected from manufacturer's standard range.
      b. Color: As indicated on the Drawings.
      c. Color: _____.

B. Basis of Design: Reflection Brick as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented non-loadbearing solid units with a net area compressive strength of greater than or equal to 3500 psi.
   2. Compliance: ASTM C 1634.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Units specified to have a fine finish surface manufactured with County Materials'

proprietary face mix.
5. Concrete Face Brick are manufactured with Integral Water Repellent.
6. Size, RB2: 3-1/4 x 3-3/4 x 7 inches.
7. Size, RB3: 3-1/4 x 3-3/4 x 10-3/4 inches.
8. Size, RB4: 3-1/4 x 3-3/4 x 14-1/2 inches.
9. Size, RB5: 3-1/4 x 3-3/4 x 18-1/4 inches.
10. Color: Variegated color blending.
    a. Color: As selected from manufacturer's standard range.
    b. Color: As indicated on the Drawings.
    c. Color: _____.

2.4 CONCRETE MASONRY VENEER UNITS

A. Basis of Design: County Stone Masonry Units as manufactured by County Materials Corporation.
1. Description: Normal weight, integrally pigmented loadbearing solid units with a net area compressive strength of greater than or equal to 2000 psi.
2. Compliance: ASTM C 90.
3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
4. Water Repellent: Integral Water Repellent.
5. Sizes, mixed:
    a. Regular Solid: 3-5/8 x 7-5/8 x 15-5/8 inches.
    b. Two Quarter Solid: 3-5/8 x 7-5/8 x 7-5/8 inches.
    c. Half Course Solid: 3-5/8 x 3-5/8 x 15-5/8 inches.
6. Color, Blended:
    a. Color: As selected from manufacturer's standard range.
    b. Color: As indicated on the Drawings.
    c. Color: _____.
7. Color, Solid:
    a. Color: As selected from manufacturer's standard range.
    b. Color: As indicated on the Drawings.
    c. Color: _____.

B. Basis of Design: Reflection Stone Masonry Units as manufactured by County Materials Corporation.
1. Description: Normal weight, integrally pigmented loadbearing solid units with a net area compressive strength of greater than or equal to 2000 psi.
2. Compliance: ASTM C 90.
3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
4. Units specified to have a fine finish surface manufactured with County Materials' proprietary face mix.
5. Concrete Masonry Veneer Units are manufactured with Integral Polymer Emulsion Water Repellent.
6. Size, R1: 3-1/4 x 3-3/4 x 3-1/4 inches.
7. Size, R2: 3-1/4 x 3-3/4 x 7 inches.
8. Size, R3: 3-1/4 x 3-3/4 x 10-3/4 inches.
9. Size, R4: 3-1/4 x 3-3/4 x 14-1/2 inches.
10. Size, R5: 3-1/4 x 3-3/4 x 18-1/4 inches.
11. Size, R6: 7 x 3-3/4 x 7 inches.
12. Size, R7: 7 x 3-3/4 x 10-3/4 inches.
13. Size, R8: 7 x 3-3/4 x 14-1/2 inches.
14. Size, R9: 7 x 3-3/4 x 18-1/4 inches.
15. Color: Variegated color blending as selected from manufacturers standard selections.
    a. Color: As selected from manufacturer's standard range.
    b. Color: As indicated on the Drawings.
    c. Color: _____.

C. Basis of Design: Reflection Stone GRAND Masonry Units as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented loadbearing solid units with a net area compressive strength of greater than or equal to 2000 psi.
   2. Compliance: ASTM C 90.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Units specified to have a fine finish surface manufactured with County Materials' proprietary face mix.
   5. Concrete Masonry Veneer Units are manufactured with Integral Polymer Emulsion Water Repellent.
   6. Size, RG1: 10-3/4 x 3-3/4 x 10-3/4 inches.
   7. Size, RG2: 10-3/4 x 3-3/4 x 14-11/16 inches.
   8. Size, RG3: 10-3/4 x 3-3/4 x 18-7/16 inches.
   9. Size, RG4: 10-3/4 x 3-3/4 x 22-3/16 inches.
   10. Color: Variegated color blending as selected from manufacturers standard selections.
      a. Color: As selected from manufacturer's standard range.
      b. Color: As indicated on the Drawings.
      c. Color: _____.

2.5 CONCRETE THIN VENEER UNITS

A. Basis of Design: County Stone Masonry Units as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented solid units with a net area compressive strength of greater than or equal to 2000 psi.
   2. Compliance: ASTM C 90.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Water Repellent: Integral Water Repellent.
   5. Facing Texture Style: Tumbled
   6. Sizes, mixed:
      a. Regular Face: 3/4 x 7-5/8 x 15-5/8 inches.
      b. Two Quarter Face: 3/4 x 7-5/8 x 7-5/8 inches.
      c. Half Course Face: 3/4 x 3-5/8 x 15-5/8 inches.
      d. Half Course Corner: 3/4 x 3-5/8 x 11-5/8 inches, with 3-5/8 inch return.
      e. Three Quarter Corner: 3/4 x 7-5/8 x 11-5/8 inches, with 3-5/8 inch return.
   7. Color, Blended:
      a. Color: As selected from manufacturer's standard range.
      b. Color: As indicated on the Drawings.
      c. Color: _____.
   8. Color, Solid:
      a. Color: As selected from manufacturer's standard range.
      b. Color: As indicated on the Drawings.
      c. Color: _____.

B. Basis of Design: Heritage Collection Designer Concrete Brick as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented units with a net area compressive strength of greater than or equal to 2000 psi.
   2. Compliance: ASTM C 90.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Water Repellent: Integral Water Repellent.
   5. Facing Texture Style:
      a. Smooth.
      b. Splitface.
      c. Rough Estate.
      d. Tumbled.
   6. Size and Shape:

a. Modular Face: 3/4 x 2-1/4 x 7-5/8 inches.
b. Modular Corner: 3-5/8 x 2-1/4 x 7-5/8 inches, 3/4 inch thickness.
c. Modular Edge Cap: 3-5/8 x 2-1/4 x 7-5/8 inches, 3/4 inch thickness.
d. Engineer Face: 3/4 x 2-3/4 x 7-5/8 inches.
e. Engineer Corner: 3-5/8 x 2-3/4 x 7-5/8 inches, 3/4 inch thickness.
f. Closure Face: 3/4 x 3-5/8 x 7-5/8 inches.
g. Closure Corner: 3-5/8 x 3-5/8 x 7-5/8 inches, 3/4 inch thickness.
h. Utility Face: 3/4 x 3-5/8 x 11-5/8 inches.
i. Utility Corner: 3-5/8 x 3-5/8 x 11-5/8 inches, 3/4 inch thickness.
j. Utility Edge Cap: 3-5/8 x 3-5/8 x 11-5/8 inches, 3/4 inch thickness.
k. Half High Face: 3/4 x 3-5/8 x 15-5/8 inches.
l. Half High Corner: 7-5/8 x 3-5/8 x 15-5/8 inches, 3/4 inch thickness.
m. Full High Face: 3/4 x 7-5/8 x 15-5/8 inches.
n. Full High Corner: 7-5/8 x 7-5/8 x 15-5/8 inches, 3/4 inch thickness.

7. Style: Blended.
   a. Color: As selected from manufacturer's standard range.
   b. Color: As indicated on the Drawings.
   c. Color: _____.
8. Style: No Flash.
   a. Color: As selected from manufacturer's standard range.
   b. Color: As indicated on the Drawings.
   c. Color: _____.

C. Basis of Design: Premier Ultra Burnished Masonry Units as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented solid units with a net area compressive strength of greater than or equal to 2000 psi.
   2. Compliance: ASTM C 90.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Water Repellent: Integral Water Repellent.
   5. Size and Shape: Half High Face: 3/4 x 3-5/8 x 15-5/8.
   6. Size and Shape: Half High Corner: 7-5/8 x 3-5/8 x 15-5/8, 3/4 inch thickness.
   7. Size and Shape: Full High Face: 3/4 x 7-5/8 x 15-5/8.
   8. Size and Shape: Full High Corner: 7-5/8 x 7-5/8 x 15-5/8, 3/4 inch thickness.
   9. Size: 1 x 3-5/8 x 23-5/8 inches.
   10. Size: 1 x 7-5/8 x 23-5/8 inches.
   11. Size: 1 x 11-5/8 x 23-5/8 inches.
   12. Size: 1 x 15-5/8 x 23-5/8 inches.
   13. Corner Size: 3-5/8 x 3-5/8 x 15-5/8 inches, 1 inch thickness.
   14. Corner Size: 3-5/8 x 7-5/8 x 15-5/8 inches, 1 inch thickness.
   15. Corner Size: 3-5/8 x 11-5/8 x 15-5/8 inches, 1 inch thickness.
   16. Corner Size: 3-5/8 x 15-5/8 x 15-5/8 inches, 1 inch thickness.
   17. Color: As selected from manufacturer's standard range.
   18. Color: As indicated on the Drawings.
   19. Color: _____.

D. Basis of Design: Reflection Stone Masonry Units as manufactured by County Materials Corporation.
   1. Description: Normal weight, integrally pigmented solid units with a net area compressive strength of greater than or equal to 2000 psi.
   2. Compliance: ASTM C 90.
   3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
   4. Units specified to have a fine finish surface manufactured with County Materials' proprietary face mix.
   5. Concrete Masonry Veneer Units are manufactured with Integral Polymer Emulsion Water Repellent.
   6. Size, RTV1: 3-1/4 x 1 x 3-1/4 inches.

7. Size, RTV2: 3-1/4 x 1 x 7 inches.
8. Size, RTV3: 3-1/4 x 1 x 10-3/4 inches.
9. Size, RTV4: 3-1/4 x 1 x 14-1/2 inches.
10. Size, RTV5: 3-1/4 x 1 x 18-1/4 inches.
11. Size, RTV6: 7 x 1 x 7 inches.
12. Size, RTV7: 7 x 1 x 10-3/4 inches.
13. Size, RTV8: 7 x 1 x 14-1/2 inches.
14. Size, RTV9: 7 x 1 x 18-1/4 inches.
15. Corner Size, RTVC2: 3-1/4 x 3-3/4 x 7 inches, 1 inch thickness.
16. Corner Size, RTVC3: 3-1/4 x 3-3/4 x 10-3/4 inches, 1 inch thickness.
17. Corner Size, RTVC4: 3-1/4 x 3-3/4 x 14-1/2 inches, 1 inch thickness.
18. Corner Size, RTVC5: 3-1/4 x 3-3/4 x 18-1/4 inches, 1 inch thickness.
19. Corner Size, RTVC6: 7 x 3-3/4 x 7 inches, 1 inch thickness.
20. Corner Size, RTVC7: 7 x 3-3/4 x 10-3/4 inches, 1 inch thickness.
21. Corner Size, RTVC8: 7 x 3-3/4 x 14-1/2 inches, 1 inch thickness.
22. Corner Size, RTVC9: 7 x 3-3/4 x 18-1/4 inches, 1 inch thickness.
23. Color: Variegated color blending as selected from manufacturers standard selections.
    a. Color: As selected from manufacturer's standard range.
    b. Color: As indicated on the Drawings.
    c. Color: _____.

E. Basis of Design: Reflection Stone GRAND Masonry Units as manufactured by County Materials Corporation.
1. Description: Normal weight, integrally pigmented solid units with a net area compressive strength of greater than or equal to 2000 psi.
2. Compliance: ASTM C 90.
3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
4. Units specified to have a fine finish surface manufactured with County Materials' proprietary face mix.
5. Concrete Masonry Veneer Units are manufactured with Integral Polymer Emulsion Water Repellent.
6. Size, RGTV1: 10-3/4 x 1 x 10-3/4 inches.
7. Size, RGTV2: 10-3/4 x 1 x 14-11/16 inches.
8. Size, RGTV3: 10-3/4 x 1 x 18-7/16 inches.
9. Size, RGTV4: 10-3/4 x 1 x 22-3/16 inches.
10. Corner Size, RGTVC1: 10-3/4 x 3-3/4 x 10-3/4 inches, 1 inch thickness.
11. Corner Size, RGTVC2: 10-3/4 x 3-3/4 x 14-11/16 inches, 1 inch thickness.
12. Corner Size, RGTVC3: 10-3/4 x 3-3/4 x 18-7/16 inches, 1 inch thickness.
13. Color: Variegated color blending as selected from manufacturers standard selections.
    a. Color: As selected from manufacturer's standard range.
    b. Color: As indicated on the Drawings.
    c. Color: _____.

F. Basis of Design: Heritage Collection Designer Concrete Brick as manufactured by County Materials Corporation.
1. Description: Normal weight, integrally pigmented solid units with a net area compressive strength of greater than or equal to 2000 psi.
2. Compliance: ASTM C 90.
3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
4. Water Repellent: Integral Water Repellent.
5. Facing Texture Style:
    a. Smooth.
    b. Splitface.
    c. Rough Estate.
    d. Tumbled.
6. Size, RBTV2: 3-1/4 x 1 x 7 inches.
7. Size, RBTV3: 3-1/4 x 1 x 10-3/4 inches.

8. Size, RBTV4: 3-1/4 x 1 x 14-1/2 inches.
9. Size, RBTV5: 3-1/4 x 1 x 18-1/4 inches.
10. Corner Size, RBTVC2: 3-1/4 x 3-3/4 x 7 inches, 1 inch thickness.
11. Corner Size, RBTVC3: 3-1/4 x 3-3/4 x 10-3/4 inches.
12. Corner Size, RBTVC4: 3-1/4 x 3-3/4 x 14-1/2 inches.
13. Corner Size, RBTVC5: 3-1/4 x 3-3/4 x 18-1/4 inches.
14. Style: Blended.
    a. Color: As selected from manufacturer's standard range.
    b. Color: As indicated on the Drawings.
    c. Color: _____.
15. Style: No Flash.
    a. Color: As selected from manufacturer's standard range.
    b. Color: As indicated on the Drawings.
    c. Color: _____.

G. Basis of Design: Splitface/ Fullface Split/ Rockface Block as manufactured by County Materials Corporation.
1. Description: Normal weight, integrally pigmented solid units with a net area compressive strength of greater than or equal to 2000 psi.
2. Compliance: ASTM C 90.
3. Coloring: Integral, through-body coloring; synthetic or natural iron oxide pigments.
4. Water Repellent: Integral Water Repellent.
5. Modular Face, Size: 3/4 x 2-1/4 x 7-5/8.
6. Modular Corner, Size: 3-5/8 x 2-1/4 x 7-5/8, 3/4 inch thickness.
7. Utility Face, Size: 3/4 x 3-5/8 x 11-5/8.
8. Utility Corner, Size: 3-5/8 x 3-5/8 x 11-5/8, 3/4 inch thickness.
9. Half High Face, Size: 3/4 x 3-5/8 x 15-5/8.
10. Half High Corner, Size: 7-5/8 x 3-5/8 x 15-5/8, 3/4 inch thickness.
11. Full High Face, Size: 3/4 x 7-5/8 x 15-5/8.
12. Full High Corner, Size: 7-5/8 x 7-5/8 x 15-5/8, 3/4 inch thickness.
13. Color: As selected from manufacturer's standard range.
14. Color: As indicated on the Drawings.
15. Color: _____.

2.6 ACCESSORIES

A. Single-Wythe Joint Reinforcement:
1. Truss Type; Fabricated from cold drawn steel wire ASTM A 82; conforming to ASTM A 951; 9 gauge deformed side rods conforming to ASTM A 496 / A 496M; 9 gauge cross rods.
2. Coatings for Corrosion Protection: Mill galvanized per ASTM A 641 /A 641M, Zinc Coated (0.1 oz. per sq.ft.).
3. Coatings for Corrosion Protection: Hot-dipped galvanized per ASTM A 153 / A 153M Class B.
4. Width selected shall be approximately 2 inches (51 mm) less than nominal width of Concrete Masonry Unit.
5. Install continuously in horizontal mortar joints in vertical intervals of not more than 16 inches (406 mm).
6. Type and Manufacturer: _____.

B. Veneer Joint Reinforcement:
1. Truss Type: Fabricated from cold drawn steel wire ASTM A 82; conforming to ASTM A 951; 9 gauge deformed side rods conforming to ASTM A 496 / A 496M; 9 gauge cross rods.
2. Coating for Corrosion Protection: Mill galvanized per ASTM A 641 / A 641M, Zinc Coated (0.1 oz. per sq.ft.).
3. Coating for Corrosion Protection: Hot-dipped galvanized per ASTM A 153 / A 153M

Class B.
4. Width: Nominal 4 inch wire; actual - approximately 2 inches.
5. Install continuously in horizontal mortar joints in vertical intervals of not more than 16 inches (406 mm) O.C.
6. Type and Manufacturer: _____.

C. Veneer Anchors for Masonry Back-up: Ladder Type with Ties.
1. Truss Portion: Fabricated from cold drawn steel wire ASTM A 82; conforming to ASTM A 951; 9 gauge deformed side rods conforming to ASTM A 496 / A 496M; 9 gauge cross rods.
   a. Hot-dipped galvanized per ASTM A 153 / A 153M Class B.
   b. 3/16 inch (4.76 mm) diameter wire tabs shall be welded to truss portion at 16 inch (406 mm) O.C. horizontal spacing.
2. Ties: 3/16 inch (4.76 mm) diameter wire; Hot-dipped galvanized ASTM A 153 / A 153M Class B.
3. Truss width shall be approximately 2 inches (51 mm) less than nominal width of Concrete Masonry.
4. Ties shall be of sufficient length to embed longitudinal portion of tie into center of brick veneer +/- 1 inch (25 mm).
5. Install continuously in horizontal mortar joints in vertical intervals of not more than 16 inches (406 mm).
6. Type and Manufacturer: _____.

D. Veneer Anchors for Steel Stud Back-up: 2-Piece anchors.
1. Plate Portion: 14 gauge; Hot-dipped galvanized ASTM A 153 / A 153M Class B.
2. Ties: 3/16 inch (4.76 mm) diameter wire; Hot-dipped galvanized ASTM A 153 / A 153M Class B.
3. Ties shall be of sufficient length to embed longitudinal portion of tie into center of brick veneer +/- 1 inch (25 mm).
4. Install continuously in both horizontal and vertical intervals of not more than 16 inch (406 mm) O.C.
5. Anchors shall be installed per NCMA TEK 3-6C-12, 1 tie / 2.67 ft2 of wall surface.
6. Type and Manufacturer: _____.

E. Flashing for Single-Wythe Concrete Masonry Unit:
1. Embedded, overlapping, polypropylene pan system with integral weep spouts.
2. Flashing shall be installed at all locations where the free drainage of water is blocked.
3. Type and Manufacturer: _____.

F. Flashing for Concrete Face Brick and Concrete Masonry Veneer Unit:
1. 40-mil flexible flashing with integral drainage mat, stainless steel drip edge and weep tabs.
2. Type and Manufacturer: _____.

G. Weep Vents for Concrete Face Brick and Concrete Masonry Veneer Unit:
1. 2-5/8 inches x 3-1/2 inches x 1/2 inches (67 mm x 89 mm x 13 mm) open-weave recycled polyester mesh.
2. Weep Vents shall be installed a minimum of 32 inches (813 mm) O.C.
3. Weep Vents color shall match color of the mortar joints.
4. Type and Manufacturer: _____.

H. Conventional Grout:
1. Shall conform to ASTM C 476 and the recommendations of NCMA TEK 9-4A.
2. Grout shall be proportioned to provide slump of 8 to 11 inches as measured by ASTM C 143 / C 143M.
3. Type and Manufacturer: _____.

I. Self-consolidating Grout: Shall conform to ASTM C 476 and MSJC.
   1. Type and Manufacturer: _____.

J. Mortar for Single-Wythe Concrete Masonry Units.
   1. Masonry Cement conforming to ASTM C 91, Type S.
   2. Cement - Lime.
      a. Portland Cement: ASTM C 150.
      b. Hydrated Lime ASTM C 207, Type S.
      c. Portland and Lime shall be mixed to meet ASTM C 270 property specification Type S.
   3. Type and Manufacturer: _____.

K. Mortar for Concrete Face Brick and Concrete Masonry Veneer Unit:
   1. Masonry Cement conforming to ASTM C 91, Type N.
   2. Cement - Lime.
      a. Portland Cement: ASTM C 150
      b. Hydrated Lime ASTM C 207, Type S.
      c. Portland and Lime shall be mixed to meet ASTM C 270 property specification Type N.
   3. Mortar Color: _____.
   4. Mortar Color: Gray.
   5. Mortar Color: As indicated on Drawings.
   6. Joint Striking: _____.
   7. Joint Striking: Concave.
   8. Joint Striking: V-shaped.
   9. Joint Striking: As indicated on Drawings.

L. Aggregate for Mortar: ASTM C 144.

M. Water-Repellant Admixture: Liquid water-repellant mortar admixture or manufacturer approved equal. A complimentary water repellent mortar admixture used in the concrete unit shall be used in the mortar to ensure compatibility and bond.
   1. Type and Manufacturer: _____.

N. Water: Clean and potable.

O. Control Joints shall be built into Single-Wythe Concrete Masonry Unit walls according to the recommendations of NCMA TEK 10-2C. Joints shall not exceed the lesser of: a maximum panel length to height ratio of 1-1/2:1 or a distance of 25 ft (7.6 m).

P. Control Joints shall be built into Concrete Face Brick and Concrete Masonry Veneer Unit walls according to the recommendations of NCMA TEK 10-4. Joints shall not exceed the lesser of: a maximum panel length to height ratio of 1-1/2:1 or a distance of 20 ft (6.1 m).

Q. Control Joint Gasket: 2-5/8 inch (67 mm) PVC compound with 80 Durometer hardness conforming to ASTM D 2240.

R. Backer Rods: Backer rod diameter shall be 1/8 inch (3 mm) larger than width of the control joint.
   1. Closed-cell polyethylene foam complying to ASTM C 1330, Type C.
   2. Type and Manufacturer: _____.

S. Sealant:
   1. Elastomeric polyurethane conforming to ASTM C 920.
   2. Sealant Depth at midpoint shall be minimum 1/4 inch (6 mm); maximum 3/8 (9.5 mm).
   3. Sealant color shall match color of concrete face brick and concrete masonry unit.
   4. Type and Manufacturer: _____.

T. Cleaners: Non muriatic acid cleaner.

U. Cleaners: As applicable and after a test area is prepared.

V. Sealers: Clear-drying, water-based, silicone emulsion with 6 percent solids as measured by ASTM D 5095..
   1. Type and Manufacturer: _____

W. Sealers: As applicable and after a test area is prepared..

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examination:
   1. Verify field conditions are acceptable and ready to receive masonry.
   2. Verify the foundations or bearing elements are within tolerances conforming to the requirements of ACI 117.
   3. Verify built-in items are in proper location, and ready to receive masonry work.
   4. Verify concrete brick masonry units are according to project specification and meet appropriate ASTM specification requirements. Commencement of installation constitutes acceptance of Concrete Face Brick, Concrete Masonry Units, Concrete Masonry Veneers, and Concrete Thin Veneers.

B. Preparation: Prepare surfaces and materials in accordance with MSJC Specifications for Masonry Structures. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

C. Do not proceed with installation until substrates have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.2 INSTALLATION - CONCRETE MASONRY UNITS

A. Concrete Masonry Units:
   1. Install concrete masonry units in accordance with standard masonry practices, NCMA and MSJC Specifications for Masonry Structures and manufacturer's instructions.
   2. Bond Pattern for Exposed Masonry: Running Bond.
   3. Bond Pattern for Exposed Masonry: Stacked Bond.
   4. Bond Pattern for Exposed Masonry: As indicated on Drawings.
   5. Lay units by selecting product from more than one pallet at a time during installation.
   6. Lay units with full mortar head and bed joints.
   7. All cutting shall be done with masonry saw to provide, clean, sharp, unchipped edges.
   8. Do not use masonry units with broken corners and edges in excess of ASTM C90 and ASTM C1634.
   9. Temporary Formwork and Shores: Construct formwork to support reinforced masonry elements during construction.
   10. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

B. Control Joints: Designed to reduce restraint and permit longitudinal movement. Per NCMA Tek Note 10-2C and 10-4, proper control joint spacing is required for concrete masonry walls.
   1. Single-Wythe Concrete Masonry Units: Joints shall not exceed the lesser of: a maximum panel length to height ration of 1-1/2:1 or a distance of 25 feet.
   2. Concrete Face Brick: Joints shall not exceed the lesser of: a maximum panel length to height ratio of 1-1/2:1 or a distance of 20 feet.

C. Mortar and Mortar Joints:
   1. Mortar Mixing.
      a. Mix mortar ingredients in accordance with ASTM C270.
      b. Add mortar coloring.
      c. Add water repellent admixture specified by manufacturer.
      d. Mix mortar components between 3 and five minutes.
   2. Mortar Joints
      a. Tool exposed joints when mortar is thumbprint hard, using jointer larger than joint thickness.
      b. Remove excess mortar smears as work progresses.

D. Horizontal Joint Reinforcement:
   1. Place joint reinforcements in horizontal mortar joints in first course, at 8 inches above and below openings, and below bearing locations.
   2. Install joint reinforcement in the bed joints 16 inches (406 mm) on center vertically in veneer applications, in the exterior wythe of composite and noncomposite wall construction, and in through-wall masonry construction.
   3. Nonstructural, horizontal, joint reinforcement should not be installed continuously through control joints.

E. Veneer Anchors and Ties: Install to allow for vertical and horizontal movement. Ties must be securely attached to studs through sheathing and/or insulation and not to the sheathing/insulation alone.

F. Ambient Conditions: When ambient air temperature is outside the range of 40 to 90 degrees F (4.4 to 32.2 degrees C), implement procedures and comply with recommendations in accordance with MSJC Specification for Masonry Structures.

G. During construction and until the walls are roofed, the coping is installed, or the top bond beam course is grouted solid, keep walls covered to prevent rain or snow intrusion into the concrete masonry units cores or wall cavities.

H. Contractor shall keep masonry units, walls and surrounding work clean during construction following standard masonry practices. Mortar soiling (including but not limited to droppings, splatters, smears) shall be removed at the end of each day. Remove mortar soiling from masonry work and connecting work before its final set. Mortar droppings that adhere to the exposed face of the units shall be removed using brick/block scrap after being allowed to harden, without causing damage to the exposed face of installed brick. Remaining mortar shall be removed with a stiff fiber brush.

I. Keep concrete masonry units and walls clean during construction. Prevent grout or mortar from staining the face of masonry. Mortar and grout soiling (droppings, spatters, and smears) shall be removed at the end of each day following standard masonry practices.

J. All concrete masonry units shall be cleaned in strict accordance with specified cleaning agent manufacturer's instructions. Mild masonry detergents/cleaners and power washing systems shall be properly used. Strong acids, acid washes, or chemicals with a strong acid reaction shall not be used.

K. Loading:
   1. Do not apply uniform floor or roof loads for a minimum of 12 hours after building masonry walls.
   2. Do not apply concentrated loading for a minimum of 3 days after building masonry walls or columns.

L. Flashing and Weeps:
   1. Install flashing as indicated on drawings, as specified herein and in all of the following locations:

a. Above grade at base of walls.
b. Under and behind sills.
c. Over openings.
d. At spandrels and shelf angles.
e. On top of bond-beams if used mid-wall.

2. Weep Vents shall be provided at all flashing locations at intervals not to exceed 32 inches (813 mm) O.C.

M. Cleaning:
1. All caulking and sealant materials shall be in place and cured prior to cleaning.
2. Application of cleaner above 50 psi. is prohibited.
3. A test panel shall be cleaned and approved by architect prior to general wall cleaning.

N. Contractor shall keep concrete units, walls and surrounding work clean during construction following standard masonry practices. Mortar soiling (including but not limited to droppings, splatters, smears) shall be removed at the end of each day. Remove mortar soiling from masonry work and connecting work before its final set. Mortar droppings that adhere to the exposed face of the units shall be removed using brick/block scrap after being allowed to harden, without causing damage to the exposed face of installed units. Remaining mortar shall be removed with a stiff fiber brush.

O. At installation completion of exposed concrete units, tuck-point holes and imperfections in joints of all exposed masonry surfaces, completely filling with mortar. Tool to match surrounding mortar joints. After pointing hardens, and within fourteen days of finished work, clean masonry surfaces of all excess mortar soiling and dirt.

P. Sealers:
1. A test panel shall be cleaned and approved by architect prior to general wall cleaning.

Q. Protection:
1. Protect installed work from damage due to subsequent construction activity on the site.
2. Protect masonry materials during storage and construction to prevent moisture intrusion and soilage.
3. During erection, cover tops of walls to prevent moisture penetration into cores of concrete masonry units and cavities of wall system.
4. Provide final protection and maintain jobsite conditions that ensure concrete brick masonry is without damage, deterioration, or soiling.

3.3 INSTALLATION - CONCRETE FACE BRICK

A. Concrete Face Brick:
1. Install concrete units in accordance with standard masonry practices, NCMA and MSJC Specifications for Masonry Structures and manufacturer's instructions.
2. Bond Pattern for Exposed Masonry: As indicated on Drawings.
3. Lay units by selecting product from more than one pallet at a time during installation.
4. Lay units with full mortar head and bed joints.
5. All cutting shall be done with masonry saw to provide, clean, sharp, unchipped edges.
6. Do not use masonry units with broken corners and edges in excess of ASTM C90 and ASTM C1634.
7. Temporary Formwork and Shores: Construct formwork to support reinforced masonry elements during construction.
8. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

B. Control Joints: Designed to reduce restraint and permit longitudinal movement. Per NCMA Tek Note 10-2C and 10-4, proper control joint spacing is required for concrete masonry veneer walls.

1. Concrete Face Brick: Joints shall not exceed the lesser of: a maximum panel length to height ratio of 1-1/2:1 or a distance of 20 feet.

C. Mortar and Mortar Joints:
   1. Mortar Mixing.
      a. Mix mortar ingredients in accordance with ASTM C270.
      b. Add mortar coloring.
      c. Add water repellent admixture specified by manufacturer.
      d. Mix mortar components between 3 and five minutes.
   2. Mortar Joints
      a. Tool exposed joints when mortar is thumbprint hard, using jointer larger than joint thickness.
      b. Remove excess mortar smears as work progresses.

D. Horizontal Joint Reinforcement:
   1. Place joint reinforcements in horizontal mortar joints in first course, at 8 inches (203 mm) above and below openings, and below bearing locations.
   2. Install joint reinforcement in the bed joints 16 inches (406 mm) on center vertically in veneer applications, in the exterior wythe of composite and non-composite wall construction.
   3. Nonstructural, horizontal, joint reinforcement shall not be installed continuously through control joints.

E. Veneer Anchors and Ties: Install to allow for vertical and horizontal movement. Ties shall be securely attached to studs through sheathing and/or insulation and not to the sheathing/insulation alone complying with NCMA TEK 3-6C-12

F. Ambient Conditions: When ambient air temperature is outside the range of 40 to 90 degrees F (4.4 to 32.2 degrees C), implement procedures and comply with recommendations in accordance with MSJC Specification for Masonry Structures.

G. During construction and until the walls are roofed, the coping is installed, or the top bond beam course is grouted solid, keep walls covered to prevent rain or snow intrusion into the concrete face brick or wall cavities.

H. Keep concrete face brick units and walls clean during construction. Prevent grout or mortar from staining the face of masonry. Mortar and grout soiling (droppings, spatters, and smears) shall be removed at the end of each day following standard masonry practices.

I. Loading:
   1. Do not apply uniform floor or roof loads for a minimum of 12 hours after building masonry walls.
   2. Do not apply concentrated loading for a minimum of 3 days after building masonry walls or columns.

J. Flashing and Weeps:
   1. Install flashing as indicated on drawings, as specified herein and in all of the following locations:
      a. Above grade at base of walls.
      b. Under and behind sills.
      c. Over openings.
      d. At spandrels and shelf angles.
      e. On top of bond-beams if used mid-wall.
   2. Weep Vents shall be provided at all flashing locations at intervals not to exceed 32 inches (813 mm) O.C.

K. Cleaning:
   1. All caulking and sealant materials shall be in place and cured prior to cleaning.

2. Application of cleaner above 50 psi is prohibited.
3. A test panel shall be cleaned and approved by architect prior to general wall cleaning.

L. Contractor shall keep concrete face brick units, walls and surrounding work clean during construction following standard masonry practices. Mortar soiling (including but not limited to droppings, splatters, smears) shall be removed at the end of each day. Remove mortar soiling from masonry work and connecting work before its final set. Mortar droppings that adhere to the exposed face of the units shall be removed using brick/block scrap after being allowed to harden, without causing damage to the exposed face of installed units. Remaining mortar shall be removed with a stiff fiber brush.

M. At installation completion of exposed concrete face brick units, tuck-point holes and imperfections in joints of all exposed masonry surfaces, completely filling with mortar. Tool to match surrounding mortar joints. After pointing hardens, and within fourteen days of finished work, clean masonry surfaces of all excess mortar soiling and dirt.

N. Protection:
1. Protect installed work from damage due to subsequent construction activity on the site.
2. Protect masonry materials during storage and construction to prevent moisture intrusion and soilage.
3. During erection, cover tops of walls to prevent moisture penetration into concrete face brick units and cavities of wall system.
4. Provide final protection and maintain jobsite conditions that ensure concrete masonry veneer units are without damage, deterioration, or soiling.

3.4 INSTALLATION - CONCRETE MASONRY VENEER UNIT

A. Concrete Masonry Veneer Unit:
1. Install concrete masonry veneer units in accordance with MSJC Specifications for Masonry Structures and manufacturer's instructions.
2. Bond Pattern for Exposed Masonry: As indicated on Drawings.
3. Lay units by selecting product from more than one pallet at a time during installation.
4. Lay units with full mortar head and bed joints.
5. All cutting shall be done with masonry saw to provide, clean, sharp, unchipped edges.
6. Do not use masonry units with broken corners and edges in excess of ASTM C90 and ASTM C1634.
7. Temporary Formwork and Shores: Construct formwork to support reinforced masonry elements during construction.
8. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

B. Control Joints: Designed to reduce restraint and permit longitudinal movement. Per NCMA Tek Note 10-2C and 10-4, proper control joint spacing is required for concrete masonry veneer walls.
1. Concrete Masonry Veneer Unit: Joints shall not exceed the lesser of: a maximum panel length to height ratio of 1-1/2:1 or a distance of 20 feet.

C. Mortar and Mortar Joints:
1. Mortar Mixing.
a. Mix mortar ingredients in accordance with ASTM C270.
b. Add mortar coloring.
c. Add water repellent admixture specified by manufacturer.
d. Mix mortar components between 3 and five minutes.
2. Mortar Joints
a. Tool exposed joints when mortar is thumbprint hard, using jointer larger than joint thickness.

b. Remove excess mortar smears as work progresses.

D. Horizontal Joint Reinforcement:
1. Place joint reinforcements in horizontal mortar joints in first course, at 8 inches (203 mm) above and below openings, and below bearing locations.
2. Install joint reinforcement in the bed joints 16 inches (406 mm) on center vertically in veneer applications, in the exterior wythe of composite and non-composite wall construction.
3. Nonstructural, horizontal, joint reinforcement shall not be installed continuously through control joints.

E. Veneer Anchors and Ties: Install to allow for vertical and horizontal movement. Ties shall be securely attached to studs through sheathing and/or insulation and not to the sheathing/insulation alone complying with NCMA TEK 3-6C-12

F. Ambient Conditions: When ambient air temperature is outside the range of 40 to 90 degrees F (4.4 to 32.2 degrees C), implement procedures and comply with recommendations in accordance with MSJC Specification for Masonry Structures.

G. During construction and until the walls are roofed, the coping is installed, or the top bond beam course is grouted solid, keep walls covered to prevent rain or snow intrusion into the Concrete Masonry Veneer Unit or wall cavities.

H. Keep concrete masonry veneer units and walls clean during construction. Prevent grout or mortar from staining the face of masonry. Mortar and grout soiling (droppings, spatters, and smears) shall be removed at the end of each day following standard masonry practices.

I. Loading:
1. Do not apply uniform floor or roof loads for a minimum of 12 hours after building masonry walls.
2. Do not apply concentrated loading for a minimum of 3 days after building masonry walls or columns.

J. Flashing and Weeps:
1. Install flashing as indicated on drawings, as specified herein and in all of the following locations:
a. Above grade at base of walls.
b. Under and behind sills.
c. Over openings.
d. At spandrels and shelf angles.
e. On top of bond-beams if used mid-wall.
2. Weep Vents shall be provided at all flashing locations at intervals not to exceed 32 inches (813 mm) O.C.

K. Cleaning:
1. All caulking and sealant materials shall be in place and cured prior to cleaning.
2. Application of cleaner above 50 psi is prohibited.
3. A test panel shall be cleaned and approved by architect prior to general wall cleaning.

L. Contractor shall keep concrete masonry veneer units, walls and surrounding work clean during construction following standard masonry practices. Mortar soiling (including but not limited to droppings, splatters, smears) shall be removed at the end of each day. Remove mortar soiling from masonry work and connecting work before its final set. Mortar droppings that adhere to the exposed face of the units shall be removed using brick/block scrap after being allowed to harden, without causing damage to the exposed face of installed units. Remaining mortar shall be removed with a stiff fiber brush.

M. Contractor shall keep concrete masonry veneer units, walls and surrounding work clean

during construction following standard masonry practices. Mortar soiling (including but not limited to droppings, splatters, smears) shall be removed at the end of each day. Remove mortar soiling from masonry work and connecting work before its final set. Mortar droppings that adhere to the exposed face of the units shall be removed using brick/block scrap after being allowed to harden, without causing damage to the exposed face of installed units. Remaining mortar shall be removed with a stiff fiber brush.

N. At installation completion of exposed concrete masonry veneer units, tuck-point holes and imperfections in joints of all exposed masonry surfaces, completely filling with mortar. Tool to match surrounding mortar joints. After pointing hardens, and within fourteen days of finished work, clean masonry surfaces of all excess mortar soiling and dirt.

O. Protection:
   1. Protect installed work from damage due to subsequent construction activity on the site.
   2. Protect masonry materials during storage and construction to prevent moisture intrusion and soilage.
   3. During erection, cover tops of walls to prevent moisture penetration into concrete masonry veneer units and cavities of wall system.
   4. Provide final protection and maintain jobsite conditions that ensure concrete masonry veneer units are without damage, deterioration, or soiling.

3.5 INSTALLATION - CONCRETE THIN VENEERS

A. Install concrete thin veneers in accordance with manufacturer's written instructions and recommendations.
   1. For Field Applications: Install according to the Masonry Veneer Manufacturers Association Installation Guide for Adhered Masonry Veneer and local building codes.
   2. For Field Applications: Mortared head and bed joints shall be the full thickness of the CMU face shells.
   3. For Precast or Tilt-up Concrete Applications: Install according to Precast Concrete Institute and Tilt-Up Concrete Association guidelines and local building codes.

B. Assembly:
   1. Units shall be mixed from several cartons or pallets during installation.
   2. For Precast or Tilt-up Concrete Applications: Units shall be waxed sufficiently on faces to be exposed to prevent adhesion by concrete/mortar.

C. Control Joints: Designed to reduce restraint and permit longitudinal movement. Per NCMA Tek Note 10-2C and 10-4, proper control joint spacing is required for all concrete masonry walls.

D. Control Joint Placement: Locate control joints where volume changes in the masonry due to drying shrinkage, carbonation, or temperature changes are likely to create tension in the masonry that will exceed its capacity.

E. Design Practices and Installation: NCMA Recommendation for Control Joint Spacing for Above Grade Exposed Concrete Masonry Walls; Tek Notes 10-2C and 10-4.

F. Empirical Crack Control: For walls containing masonry parapets, do not consider the parapet as part of the masonry wall below if recommended through-wall flashing is utilized at the roof/parapet intersection, which will render the parapet as an independent wall element.

G. Mortar and Mortar Joints for Field Applications: Strike mortar joints when the mortar is thumbprint hard. Raked, flush, beaded, or extruded joints are not recommended by manufacturer as they do not compact the mortar and create ledges that intercept water running down the face of the wall. Mortared head and bed joints shall be the full thickness of the CMU face shells.

H. Cleaning Procedures For Field Application:
   1. All caulking and sealant materials shall be in place and cured prior to cleaning.
   2. Application of cleaner above 50 psi. is prohibited.
   3. A test panel shall be cleaned and approved by architect prior to general wall cleaning.

I. Contractor shall keep concrete units, walls and surrounding work clean during construction following standard masonry practices. Mortar soiling (including but not limited to droppings, splatters, smears) shall be removed at the end of each day. Remove mortar soiling from masonry work and connecting work before its final set. Mortar droppings that adhere to the exposed face of the units shall be removed using brick/block scrap after being allowed to harden, without causing damage to the exposed face of installed units. Remaining mortar shall be removed with a stiff fiber brush.

J. Sealers: A test panel shall be cleaned and approved by architect prior to general wall cleaning.

K. Cleaning Procedures: For precast or tilt-up concrete applications:
   1. All caulking and sealant materials shall be in place and cured prior to cleaning.
   2. Application of cleaner above 50 psi. is prohibited.
   3. A test panel shall be cleaned and approved by architect prior to general wall cleaning.

L. Contractor shall keep concrete units, walls and surrounding work clean during construction following standard masonry practices. Mortar soiling (including but not limited to droppings, splatters, smears) shall be removed at the end of each day. Remove mortar soiling from masonry work and connecting work before its final set. Mortar droppings that adhere to the exposed face of the units shall be removed using brick/block scrap after being allowed to harden, without causing damage to the exposed face of installed units. Remaining mortar shall be removed with a stiff fiber brush.

M. Sealers: A test panel shall be cleaned and approved by architect prior to general wall cleaning.

N. Protection: Protect installed work from damage due to subsequent construction activity on the site.
   1. Strong acids, acid washes, chemicals with a strong acid reaction and abrasives may not be used, as they may etch the surface and distort color.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rough Hardware
   2. Pipe Bollards
   3. Aluminum Tread Plates
   4. Miscellaneous Metal Trim
   5. Steel Framing and Supports for Applications where framing and supports are not specified in other Sections

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
   1. Product data for products used in miscellaneous metal fabrications, including paint products and grout.

B. Shop Drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details (fully dimensioned) of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

C. Samples representative of materials and finished products as may be requested by the Design Professional.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this Section by same firm that fabricated them.

C. Quality welding processes and welding operators in accordance with the following:
   1. AWS D1.1 "Structural Welding Code - Steel"
   2. D1.3 "Structural Welding Code - Sheet Steel"
   3. D1.2 "Structural Welding Code - Aluminum"

D. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.4 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.
   1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.5 COORDINATION

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

1.6 SYSTEM DESCRIPTION

A. System Performance Requirements:
   1. All platforms, treads, and landings of ramps: Capable of withstanding a uniform load of 100 lb. per square foot and a concentrated load of 300 lb. per square foot on an area of 4 square inches located in the center of the aluminum tread plate, whichever produces the greater stress.

PART 2 - PRODUCTS

2.1 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36

C. Steel Pipe: ASTM A53
   1. Black finish, unless otherwise indicated.
   2. Galvanized finish for exterior installations, unless shown to receive special coatings.
   3. Type E, OR S, Grade B, Fy = 35 KSI, unless otherwise indicated, or another weight, type, and grade required by structural loads.

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Aluminum –Alloy Rolled Tread Plates: ASTM B 632/B 632M, alloy 6061-T6.

F. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

G. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

H. Welding Rods and Bare Electrodes: Select in accordance with AWS Specifications for the metal alloy to be welded.

2.2 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required for each application and complying with applicable standards.
   1. Bolts and Nuts: Regular hexagon head bolts, ASTM A-307, Grade A with hex nuts ASTM A 563; and, where indicated, flat washers.
   2. High Strength Bolts, Nuts and Washers: ASTM A-325, Type 1 heavy hex steel structural bolts, heavy hex carbon-steel nuts, hardened carbon-steel washers.
   3. Anchor Bolts: ASTM F 1554, Grade30
   4. Lag Bolts: Square head type, ASME B18.2.1
   5. Machine Screws: Cadmium plated steel, ASME B18.6.3
   6. Wood Screws: Flat head carbon steel, ASME B18.6.1
   7. Plain Washers: Round, carbon steel, ASME B18.22.1
   8. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1
   9. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
      a. Interior Use - Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
      b. Exterior Use - Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.
   10. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.3 CONCRETE FILL AND REINFORCING MATERIALS

A. Concrete Materials and Properties: Comply with requirements of Section 03300, and as shown on Drawings, with minimum 28-day compressive strength of 3,000 PSI, unless otherwise indicated.

B. Non-slip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rustproof and non-glazing; unaffected by freezing, moisture, or cleaning materials.

C. Reinforcing Bars: ASTM A-615, Grade 60, unless noted otherwise.

2.4 PAINT

A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead and chromate-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-664.

B. Acceptable Manufacturers:
   1. Carboline 621; Carboline Co. (314-644-1000)
   2. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc. (800-258-6398)
   3. Tneme-Zinc 90-97; Tnemec Co. (816-483-3400)

C. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

2.5 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.6 FABRICATION - GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Allow for thermal movement resulting from the following maximum change (range) of exterior metalwork in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss. Temperature Change (Range): 120 Degrees F., ambient; 130 degrees F., material surfaces.

C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts. Locate joints where least conspicuous.

D. Weld corners and seams continuously to comply with AWS recommendations and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

F. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Spacing of anchors shall not be more than 24" o.c.

2.8 PIPE BOLLARDS

A. ASTM A153 schedule 40 steel pipe with concrete fill, as detailed on Drawings. Provide smooth radius of concrete top to prevent accumulation of rainwater. Provide field painted finish.

2.9 MISCELLANEOUS STEEL TRIM

A. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.
1. Galvanize miscellaneous framing and supports in exterior locations, where indicated.

2.10 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for “Architectural and Metal Products” for recommendations relative to application and designations of finishes. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

A. Unless indicated otherwise, all exposed exterior steel framing, including beams, posts, bracing, guides, anchors, platforms, railings, stairs, ladders and miscellaneous steel elements, and partially concealed elements such as steel lintels and veneer supports shall be hot-dip galvanized.

B. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process in compliance with the following requirements:
   1. ASTM A-153 for galvanizing iron and steel hardware.
   2. ASTM A-123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

C. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications: Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

D. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

2.12 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1

2.13 ALUMINUM TREAD PLATE

A. General: Construct aluminum tread plate for exterior ramp to conform to sizes and arrangement indicated. Join pieces together by welding, unless otherwise indicated. Provide complete assemblies, including metal framing, strut, clips, brackets, bearing plates, and other components necessary for the support of ramp and as required to anchor and contain the ramp on the supporting structure.

B. General: Fabrication:
   1. Form ramp treads from material of size, thickness, and shapes indicated, but not less than that needed to comply with performance requirements indicated. Work to

dimension indicated or accepted on Shop Drawings, using proven details of fabrication and support.

2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges
3. Shear and punch metals cleanly and accurately
4. Remove sharp or rough areas on exposed surfaces
5. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work
6. Weld corners and seams continuously to comply with the following:
   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove welding flux immediately.
   d. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.
7. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts. Locate joints where least conspicuous.

C. Metal Treads: Shape metal treads to conform to configuration shown. Provide thicknesses of structural steel sheet, to support total design loading.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set Sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correctly welding work, and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

3.3 INSTALLING PIPE BOLLARDS

A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solidly with nonshrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8" toward bollard.

B. Fill pipe with concrete which extends ½" above top of pipe. Concrete shall be rounded at the top and shall be sloped to the sides.

C. Paint bollards safety yellow.

3.4 TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA1 requirements for touch-up of field painted surfaces.

B. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

C. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 05 51 33
METAL LADDERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fixed Ladder Systems:
   1. Angled fixed ladders. (RL20 Series).
   2. Standard fixed ladders. (RL30 Series).
   3. Caged fixed ladders. (RL40 Series).

B. Ladder Accessories:
   1. Ladder fall arrest system.
   2. Ladder security door.
   3. Cage security gate.
   4. Self-closing gate.

C. Folding Ladder Systems:
   1. Fold down ladders. (RL60 Series).
   2. Fold down ladders suspension frames and ceiling ladder kits.

1.2 RELATED SECTIONS

A. Section 05 12 13 - Architecturally-Exposed Structural Steel Framing.

B. Section 05 55 00 - Metal Stair Treads and Nosings.

C. Section 06 10 00 - Rough Carpentry.

D. Section 07 42 00 - Wall Panels.

1.3 REFERENCES

A. Occupational Safety and Health Administration of the United States (OSHA):
   1. OSHA 1910.23: Fixed Ladders.
   2. OSHA 1910.29: Fall Protection systems and falling object protection.

B. American National Standards Institute (ANSI):
   1. ANSI A14.3: Ladders - Fixed - Safety Requirements.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Provide plan, section, elevation and perspective view drawings as necessary to depict appropriate installation procedures including location, mounting, attachment, and penetration flashing as applicable.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by

a single manufacturer with a minimum of ten years experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Rebuild mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation. Protect all components off the ground, away from standing water on a hard, level surface.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. Warranty: At project closeout, submit an executed copy of the manufacturer's five year standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. All manufacturers are accepted provided they comply with the specifications given in the Technical Specifications Book.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 RL20 SERIES MINI ACCESS LADDERS

A. Description: Modular Angled Aluminum Fixed Ladder for safe access between minimal elevation changes.

B. Model RL21: Angled Fixed Ladder with Grabrails.
   1. Material: High tensile 6106-T6 aluminum, mill finish.
   2. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
   3. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
   4. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
   5. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

C. Model RL22: Angled fixed ladder with parapet platform.
   1. Material: High tensile 6106-T6 aluminum, mill finish.

2. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
3. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
4. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
5. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

D. Model RL23: Angled fixed ladder with 8 ft (2438 mm) walkway.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
3. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
4. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
5. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

E. Model RL25: Angled fixed ladder with 3 ft (914 mm) walkway.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
3. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
4. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
5. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

F. Ladder Base Mounting and Walkway Mounting Kit:
1. Ladder Base Mount Option One: Non-penetrating 24 x 12 inches (610 x 305 mm) aluminum base plate for membrane and built-up roof systems.
2. Ladder Base Mount Option Two: Floor mount bracket set for finished floors.
3. LDWK.01: Non-penetrating weighted base kit for membrane roof systems for 8 ft (2438 mm) walkway.
4. LDWK.02: Non-penetrating clamp kit for standing seam roof systems for 8 ft (2438 mm) walkway.
5. LDWK.03: Fastening kit for metal roof systems for 8 ft (2438 mm) walkway.
6. LDWK.04: Non-penetrating weighted base kit for membrane roof systems for 3 ft (914 mm) walkway.
7. LDWK.05: Non-penetrating clamp kit for standing seam roof systems for 3 ft (914 mm) walkway.
8. LDWK.06: Fastening kit for metal roof systems for 3 ft (914 mm) walkway.

2.3 RL30 SERIES STANDARD ACCESS LADDERS

A. Modular Vertical Aluminum Fixed Ladder for safe access to elevated areas. Ladder fall arrest system required on all heights 24ft (7320 mm) or greater.

B. Model RL31: Standard fixed ladder with grabrails.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm)
4. Ladder Weight: 6.4 lbs (2.9 kg) per 40inch (1016 mm) section.
5. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
6. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

C. Model RL32: Standard fixed ladder with parapet platform.

1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
4. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
5. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
6. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

D. Model RL33: Standard fixed ladder with 8 ft (2438 mm) walkway.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
4. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
5. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
6. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

E. Model RL34: Standard fixed ladder for roof hatch access.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm).
4. Retractable Stile Set: Stiles can be retracted to allow for safe access through the roof hatch.
5. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
6. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
7. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

F. Model RL35: Standard fixed ladder with 3 ft (914 mm) walkway.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
4. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
5. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
6. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

G. Ladder Base Mounting and Walkway Mounting Kit:
1. Ladder Base Mount Option One: Non-penetrating 24 x 12 inches (610 x 305 mm) aluminum base plate for membrane and built-up roof systems.
2. Ladder Base Mount Option Two: Off-floor mount fixing bracket, heavy duty wall fixing bracket for ladders mounted to the wall only.
3. Ladder Base Mount Option Three: Floor mount bracket set for finished floors.
4. LDWK.01: Non-penetrating weighted base kit for membrane roof systems for 8 ft (2438 mm) walkway.
5. LDWK.02: Non-penetrating clamp kit for standing seam roof systems for 8 ft (2438 mm) walkway.
6. LDWK.03: Fastening kit for metal roof systems for 8 ft (2438 mm) walkway.

7. LDWK.04: Non-penetrating weighted base kit for membrane roof systems for 3 ft (914 mm) walkway.
8. LDWK.05: Non-penetrating clamp kit for standing seam roof systems for 3 ft (914 mm) walkway.
9. LDWK.06: Fastening kit for metal roof systems for 3 ft (914 mm) walkway.

2.4 RL40 SERIES CAGED ACCESS LADDERS:

A. Modular Caged Aluminum Fixed Ladder for safe access to elevated areas. A Cage is considered a form of fall protection on ladders greater than 24 ft (7320 mm) until November 19th 2018.

B. Model RL41: Caged fixed ladder with grabrails.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
4. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
5. Cage Weight: 18 lbs (8.16 kg) per 40 inch (1016 mm) section.
6. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
7. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

C. Model RL42: Caged fixed ladder with parapet platform.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
4. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
5. Cage Weight: 18 lbs (8.16 kg) per 40 inch (1016 mm) section.
6. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
7. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

D. Model RL43: Caged fixed ladder with 8 ft (2438 mm) walkway.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
4. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
5. Cage Weight: 18 lbs (8.16 kg) per 40 inch (1016 mm) section.
6. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
7. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

E. Model RL44: Caged fixed ladder for roof hatch access.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm).
4. Retractable stile set: Stiles can be retracted to allow for safe access through the roof hatch.
5. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
6. Cage Weight: 18 lbs (8.16 kg) per 40 inch (1016 mm) section.

7. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
8. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

F. Model RL45: Caged fixed ladder with 3 ft (914 mm) walkway.
1. Material: High tensile 6106-T6 aluminum, mill finish.
2. Ladder Height: Fall protection required over 24 ft (7320 mm). See ' Ladder Fall Arrest System' under ' Ladder Accessories.'
3. Ladder Width: 23-1/2 inches (597 mm). Walk-Through Width: 24 inches (610 mm).
4. Ladder Weight: 6.4 lbs (2.9 kg) per 40 inch (1016 mm) section.
5. Cage Weight: 18 lbs (8.16 kg) per 40 inch (1016 mm) section.
6. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
7. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

G. Ladder Base Mounting and Walkway Mounting Kit:
1. Ladder Base Mount Option One: Non-penetrating 24 x 12 inches (610 x 305 mm) aluminum base plate for membrane and built-up roof systems.
2. Ladder Base Mount Option Two: Off-floor mount fixing bracket, heavy duty wall fixing bracket for ladders mounted to the wall only.
3. Ladder Base Mount Option Three: Floor mount bracket set for finished floors.
4. LDWK.01: Non-penetrating weighted base kit for membrane roof systems for 8 ft (2438 mm) walkway.
5. LDWK.02: Non-penetrating clamp kit for standing seam roof systems for 8 ft (2438 mm) walkway.
6. LDWK.03: Fastening kit for metal roof systems for 8 ft (2438 mm) walkway.
7. LDWK.04: Non-penetrating weighted base kit for membrane roof systems for 3 ft (914 mm) walkway.
8. LDWK.05: Non-penetrating clamp kit for standing seam roof systems for 3 ft (914 mm) walkway.
9. LDWK.06: Fastening kit for metal roof systems for 3 ft (914 mm) walkway.

2.5 FIXED LADDER ACCESSORIES

A. Ladder Fall Arrest System:
1. Model RL50SYS: Fall arrest kit includes fall arrest mounting brackets, tensioner, termination device, sign and stainless hardware.
2. Model SL228.10: Arresta Shuttle locking device with energy absorbing lanyard (1 required per user).
3. Model SL230F: Stainless steel (316) cable Specify wall height.
4. Capacity: For single person use; 1400 lbs (635 kg) rated.
5. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.29 and ANSI A14.3.

B. Model LD426: Ladder Security Door. Aluminum security door to prevent unauthorized access. 84 x 25-1/2 inches (2134 x 648 mm).

C. Model LD425: Ladder Cage Gate. Aluminum gate to prevent unauthorized access. 37 x 30-5/8 inches (940 x 778 mm).

D. Model GW390: Self-Closing Gate. Aluminum gate for mounting at the end of the walkway kits or parapet platforms.

2.6 RL60 SERIES FOLD DOWN ACCESS LADDERS AND SUSPENSION KITS

A. Model RL62: Vista Commercial Fold Down Ladder.
   1. Material: High tensile aluminum, mill finish.
   2. Opening Size: 48 x 31 inches (1219 x 787 mm).
   3. Ladder Height Range: 7 to 10 ft (2134 to 3048 mm).
   4. Ladder Width: 23-1/2 inches (597 mm).
   5. Unit Weight: 88 lbs (40 kg).
   6. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
   7. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

B. Model RL63: Vista Maxi Fold Down Ladder.
   1. Material: High tensile aluminum, mill finish.
   2. Opening Size: 64 x 31 inches (1626 x 787 mm).
   3. Ladder Height Range: 7 to 14 ft (2134 to 4267 mm).
   4. Unit Weight: 88 lbs (40 kg).
   5. Capacity: Unit shall support a 1000 lbs (453.6 kg) loading without failure, and individual treads shall withstand a 1000 lbs (453.6 kg) loading without failure.
   6. Performance Standard: Units designed and manufactured to meet or exceed OSHA 1910.23.

C. Ladder Suspension Frame and Ceiling Ladder Kit:
   1. Model RL62: Height (in/mm): _____ between roof structure and suspended ceiling. Suspension kit can be cut to required height in the field.
   2. Model RL63: Height (in/mm): _____ between roof structure and suspended ceiling. Suspension kit can be cut to required height in the field.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been 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 surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 05 52 00

METAL RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The WORK of this section shall consist of furnishing and erecting steel hand railings on headwalls, wingwalls, or at other locations as shown on the DRAWINGS, in accordance with the designs, dimensions instructions by ENGINEER, and these SPECIFICATIONS.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Institute of Steel Construction, Inc. (AISC).

2. American Welding Society (AWS):

   a. AWS D1.1/D1.1M, Structural Welding Code – Steel.

3. ASTM International (ASTM):

   a. ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and HotDipped, Zinc-Coated, Welded and Seamless.

   b. ASTM A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

1.03 SUBMITTALS

A. CONTRACTOR shall submit detailed shop drawings based on field measurements to OWNER for review prior to fabrication.

B. Color Schedule: CONTRACTOR shall provide six (6) copies of the color schedule (if applicable) according to the DRAWINGS and SPECIFICATIONS. Color shall be shown on the DRAWINGS or shall be selected by ENGINEER from color systems of recognized paint companies. If materials of other manufacturers are used, colors shall match those selected.

C. Paint and Stain Samples: If requested by ENGINEER, prepare and submit paint samples. Remake samples until accepted.

D. Material List: As part of the submittal, include a letter listing the brand and quality of each different material for use on the PROJECT. Materials listed shall be accepted by ENGINEER before ordering materials.

PART 2 PRODUCTS

MATERIALS

A. Steel Railings and Steel Sleeves:

1. Pipe shall be standard weight pipe conforming to ASTM A53/A53M. Steel tubing shall conform to ASTM A501 or as designated on the DRAWINGS.

2. Galvanized pipe and tubing shall be required when designated on the DRAWINGS.

3. Sleeves shall be galvanized on all surfaces.

4. Weathering steel shall be required when designated on the DRAWINGS. B.

Fasteners:

1. Acceptable expansion bolts are as follows:

a. Hilti Corp; Kwik Bolt.

b. Wej-it Corp; Standard Wej-its.

c. USE; Taper-Bolt.

d. Olin Corp; Trubolt.

e. Phillips; Red Head Wedge Anchors.

2. Other brands of expansion bolts will be considered upon submission to ENGINEER of data sheets describing capacities and installation procedures of bolts.

3. The bolts, nuts, and washers shall be galvanized.

C. Miscellaneous: CONTRACTOR shall fabricate plates or structural shapes as indicated on the DRAWINGS. Include welded anchors where detailed and furnish all items to be embedded in concrete or masonry.

2.02 FABRICATION

A. General: Field measure the headwall, wingwall, or location where the railing is to be installed, compare to the DRAWINGS, and review with ENGINEER prior to fabrication.

B. Workmanship: Construct all items of sizes, shape, and materials as CONTRACTOR shall indicate and specify. Fabricate structural steel in accordance with AISC Specifications and additional requirements specified hereafter; perform fabrication and assembly in the shop to the greatest extent possible; form materials well, with sharp angles or lines, free from bends, twists, or open joints; shear and punch clean, true lines and surfaces; thickness of metal and details of assembly and supports shall provide ample strength and rigidity.

C. Welding: CONTRACTOR shall perform welding in the shop with welders qualified under the AWS D1.1/D1.1M welding code for class of work employed; protect adjacent construction and materials against damage; neatly and symmetrically make all welds; fill or grind to a uniform, smooth shape; where required to present uniform appearance, fill space between welds and weld irregularities with suitable metal putty or compound made for this purpose.

D. Fastenings: CONTRACTOR shall provide concealed fastenings wherever possible; do not use screws or bolts where they can be avoided; where used, heads shall be countersunk, screwed up tight and threads nicked to prevent loosening; and make threaded connections tight so that threads shall be entirely concealed by fittings.

E. Paint: All products not specified by name shall be “best grade” or “first line” products available by the manufacturer. Railings which are not designated to be painted shall be galvanized or weathering steel according to the DRAWINGS. Shop clean primer on hollow metal WORK immediately before painting to remove grease and dirt film from surfaces.

PART 3 EXECUTION

3.01 GENERAL

A. CONTRACTOR shall erect structural steel in accordance with the AISC Specifications with modifications and additional requirements specified hereafter.

B. Erect all WORK true to lines and planes, with vertical lines plumb and horizontal lines level.

C. Weld or bolt all permanent connections.

3.02 MISCELLANEOUS ANGLES, LINTELS, PLATES, AND EMBEDDED ITEMS

A. All welding procedures shall conform to AWS D1.1/D1.1M. All welds shall develop capacity of members being joined, unless specific length or extent is noted on the
DRAWINGS.

B. Finish all cut ends neatly without irregular torch marks or sharp fins. Grind all cut surfaces to a smooth surface. Clean of all loose mill scale, rust, and foreign matter.

C. Any shop paint on surfaces adjacent to joints to be field welded shall be wire brushed to reduce the paint film to a minimum. Grind down burrs and sharp ridges at all exposed corners and surfaces of welds prior to field painting. After field welding, welded joints to be field primed.

D. The expansion bolts shall be installed per manufacturer’s recommendations.

3.03 PAINTING

A. Inspection: Examine surfaces scheduled to receive paint and finishes for conditions that may adversely affect execution, permanence, or quality of WORK and which cannot be put into an acceptable condition through preparatory WORK as included under Paragraph Preparation.

B. Preparation:

1. Sanding: Sand metal surfaces between coats to ensure smoothness and adhesion of subsequent coats. Use extra fine sandpaper to avoid cutting the edges when sanding. Apply putty or spackling compound after surfaces are primed and primer is dry. Bring material flush with adjoining surfaces.

2. Surface Filling: Surfaces shall be perfectly dry, clean, and smooth before starting WORK. Fill cracks, holes, or scratches full and make smooth before finish is applied to surfaces.

3. Ferrous Metal: Remove foreign material from unprimed metal with wire brush and dust clean.

4. Shop Primed Metals: Touch up shop-primed metals with a primer similar to the existing.

5. Zinc-Coated Metal (Galvanized Surfaces): Wash with mineral spirits and prime as specified.

6. Protection: Furnish and lay drop cloths or mask off areas where finishing is being done to protect floors and other work from damage during the execution of WORK. Where it becomes necessary to remove temporary coverings placed by others, replace same in proper manner.

7. Damage to Work of Others: Be responsible for any damage done to the work of other trades, repairing same to the satisfaction of ENGINEER. Replace any materials damaged to such an extent that they cannot be restored to their original condition.

C. Workmanship:

1. Existing Surfaces: If the surfaces are not in proper shape for painting, repair, rebuild, or refinish before proceeding with the WORK. CONTRACTOR is responsible for any poor WORK caused by improper surfaces. The application of the first coat does not relieve CONTRACTOR of the responsibility for failure of the base coat. Do not apply any coats on either damp or wet surfaces and in no case until the preceding coat is dry and hard.

2. General: Apply materials evenly without runs or sagging of materials and according to the manufacturer’s requirements. Sand WORK between coats.

3.04 TOUCH-UP PAINTING

A. CONTRACTOR shall, after erection of steel, apply touch-up paint to field bolt heads and nuts, field welds, and abrasions. When zinc coating has been scratched or removed from surfaces, three (3) coats of zinc rich paint shall be applied over the areas where the coating has been disturbed. Where excessive removal or damage to the zinc coating has occurred, replacement of zinc coating by hot dipping in a zinc bath may be necessary at the direction of ENGINEER.

END OF SECTION

SECTION 06 05 73

FIRE RETARDANT TREATED WOOD (FTRW) - PRESSURE TREATED WOOD

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire-retardant treatment of lumber and plywood.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 06 15 00 - Wood Decking.

C. Section 06 20 00 - Carpentry.

1.3 REFERENCES

A. ASTM International (ASTM):
1. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A653 / A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM D3201 - Standard Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Base Products.
4. ASTM D5516 - Standard Test Method for Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.
5. ASTM D5664 - Standard Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber.
6. ASTM D6305 - Standard Practice for Calculating Bending Strength Design Adjustment Factors for Fire retardant Treated Plywood Roof Sheathing.
7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. American Wood-Protection Association (AWPA):
1. AWPA E12 - Standard Method of Determining the Corrosion of Metal in Contact with Wood.
2. AWPA M4 - Standard for the Care of Preservative Treated Wood Products.
3. AWPA P5 - Standard for Waterborne Preservatives.
4. AWPA P17 - Fire Retardant Formulations.
5. AWPA P50 - Standard for Fire Retardant FR-2 (FR-2).
6. AWPA T1 - Use Category System: Processing and Treatment Standard.
7. AWPA U1 - Use Category System: User Specification for Treated Wood.

C. GREENGUARD Environmental Institute: GREENGUARD Green Certified Products.

D. National Fire Protection Association (NFPA) 255 Method of Test of Surface Burning Characteristics of Building Materials.

E. ESR 2645 D-Blaze Fire Retardant Treatment; International Code Council -Evaluation Service, ICC-ES.

F. Underwriters Laboratories, Inc. (UL) 723 Tests for Surface Burning Characteristics of Building Materials.

G. Hawaiian Local Building Code Standards.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's instructions for use, including requirements for storage, cutting, and finishing.

C. Preservative Treatment Certification: Treating plant's certification of compliance with specified standards, process employed, and preservative retention values.

D. Fire-Retardant Treatment Certification: Treating plant's certification of compliance with specified requirements.

1.5 QUALITY ASSURANCE

A. Wood Treatment Plant Qualifications: Wood treatment plant experienced in performing work of this section licensed by Viance, LLC.

B. Source Quality: Obtain treated wood products from a single approved source.

C. Preservative Treatment: Mark each piece of plywood and lumber to show compliance with specified standards.

D. Fire-Retardant Treatment: Mark each piece of plywood and lumber to show compliance with specified standards.

E. Regulatory Requirements: Provide fire retardant treatment which complies with the following regulatory requirements:
1. International Building Code (IBC).
2. International Residential Code (IRC).
3. International Code Council Evaluation Service ICC-ES ESR 2645.
4. City of Los Angeles, California RR24502.
5. City of New York, New York Building Code, MEA 406 and MEA 407.
6. Hawaiian Local Building Code Standards.

F. Independent Third Party Inspection:
1. Provide plant inspections.

G. Low Chemical Emission Certification:
1. GREENGUARD Gold Certified.

H. Kiln Dry after Treatment (KDAT): Provide kiln dry material as indicated or required.
1. Kiln dry after treatment to 19 percent maximum moisture content for lumber and 18 percent for plywood in accordance with AWPA T1, Section 7 - Drying After Treatment (lumber) and AWPA T1, Section :F: Pressure treated composites (3c) kiln drying after treatment.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Exposure: Prevent wood products against moisture and dimensional changes, in accordance with instructions from treating plant.

1.7 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard 50-year limited warranty for pressure-treated FRTW wood.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

B. Substitutions: Following instructions on Drawing Set.

2.2 MATERIALS

A. Finish Lumber and Plywood: As specified in Section 06 20 00 - Finish Carpentry.

B. Fasteners and Metal Hardware Provide corrosion resistant steel fasteners with hot-dip zinc coating per ASTM A153/A153M, provide corrosion resistant hardware per ASTM A653 / A653M Class G-185 in compliance with building code requirements.

C. Fasteners used in D-Blaze Fire-Retardant Treated Wood: Use only code approved fasteners as specified in ICC-ES ESR 2645. Fasteners must be galvanized steel, stainless steel, silicon bronze or copper, in accordance with 2009 and 2006 IBC Section 2304.9.5, 2009 IRC Section R317.3 or 2006 IRC Section R319.3

2.3 FIRE RETARDANT PRESSURE TREATMENT OF LUMBER AND PLYWOOD

A. Fire retardant treatment for wood, including roof and floor trusses, roof decks and sheathing; subflooring, beams and purlins, blocking and furring, studs, joists and paneling, architectural millwork and trim, interior non-load bearing partitions and exterior load-bearing walls.
   1. Lumber: Comply with AWPA U1 UCFA, Type A or ICC-ES ESR 2645.
   2. Plywood: Comply with AWPA U1, UCFA, Type A or ICC-ES ESR 2645.
   3. Surface Burning Characteristics: UL FR-S rating; or flame spread and smoke developed ratings of 25 or less in a test of 30 minutes' duration in accordance with IBC section 2303.2.
   4. Treatment: D-Blaze FRT as manufactured by Viance.
   5. Kiln dry after treatment to 19 percent maximum moisture content for lumber and 15 percent for plywood.
   6. Treat wood used for the following applications:
      a. Roof and floor trusses.
      b. Roof decks and sheathing.
      c. Subflooring.
      d. Beams and purlins.
      e. Interior non-load bearing partitions.
      f. Studs and joists.
      g. Exterior load-bearing walls protected by weather barrier.
      h. Millwork and trim.

PART 3 EXECUTION

3.1 INSTALLATION

A. Fire-Retardant Treated Wood:
   1. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.
   2. End cuts and drilling are permitted. Do not rip or mill lumber after fire-retardant treatment.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Framing with dimension lumber.
   2. Engineered wood products.
   3. Wood furring, grounds, nailers, and blocking.

B. Related Sections:
   1. 06 05 73 (06070) - Wood Treatment.
   2. 06 16 00 (06160) – Sheathing.

1.2 SUBMITTALS

A. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:

   1. Recycled Content:
      a. Engineered Wood Products:
         1) Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
         2) Indicate relative dollar value of recycled content product to total dollar value of product included in project.
         3) If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
         4) If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.

      b. Salvaged Lumber: Provide documentation certifying products are from salvaged lumber sources.
      c. Recovered Lumber: Provide documentation certifying products are from recovered lumber sources.

   2. Local/Regional Materials:
      a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
      b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
      c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
      d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

   3. VOC data:
      a. Adhesives:
         1) Submit manufacturer’s product data for adhesives. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.

2) Submit Green Seal Certification to GS-36 and description of the basis for certification.

3) **[Submit manufacturer's certification that products comply with SCAQMD #1168.] [Submit manufacturer's certification that products comply with SCAQMD Rule 1168 in areas where exposure to freeze/thaw conditions and direct exposure to moisture will not occur. In areas where freeze/thaw conditions do exist or direct exposure to moisture can occur, submit manufacturer's certification that products comply with Bay Area AQMD Reg. 8, Rule 51 for containers larger than 16 oz and with California Air Resources Board (CARB) for containers 16 oz or less.]**

b. Engineered Wood Products: Provide documentation that composite wood and agrifiber products **[are third-party certified as meeting ANSI standard requirements for formaldehyde emissions] [contain no added urea-formaldehyde resins.]**

1) ANSI A208.1 – 1999, Particleboard

2) ANSI A208.2 – 2002, Medium Density Fiberboard (MDF) for Interior Applications

B. Letter of Certification(s) for Sustainable Forestry:

1. Forest Stewardship Council (FSC): Provide letter of certification signed by lumber supplier. Indicate compliance with FSC "Principles for Natural Forest Management" and identify certifying organization.
   a. Submit FSC certification numbers; identify each certified product on a line-item basis.
   b. Submit copies of invoices bearing the FSC certification numbers.
2. Sustainable Forestry Board: Provide letter of certification signed by lumber supplier. Indicate compliance with the Sustainable Forestry Board's "Sustainable Forestry Initiative" (SFI) and identify certifying organization.
   a. Submit SFI certification numbers; identify each certified product on a line-item basis.
   b. Submit copies of invoices bearing the SFI certification numbers.
3. Canadian Standards Association (CSA): Provide letter of certification signed by lumber supplier. Indicate compliance with the CSA and identify certifying organization.
   a. Submit CSA certification numbers; identify each certified product on a line-item basis.
   b. Submit copies of invoices bearing the CSA certification numbers.

1.3 QUALITY ASSURANCE

A. Sustainably Harvested Wood: Certification Organizations shall be accredited by the **[Forest Stewardship Council] [Sustainable Forestry Board] [Canadian Standards Association]].**

B. Recycled Content Materials: Where recycled lumber materials are used for structural applications, include lumber certification and quality grading.

C. VOC emissions: Provide low VOC products.

1. Engineered Wood Products: Provide products with no added urea formaldehyde.
   a. Determine formaldehyde concentrations in air from wood products under test conditions of temperature and relative humidity in accordance with ASTM D6007 or E1333.
   b. Determine Volatile Organic Compounds VOC), excluding formaldehyde, emitted from manufactured wood-based panels in accordance with ASTM D6330.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber:
1. Resource Management:

a. Virgin Lumber: **[Lumber fabricated from old growth timber is not permitted.]** Provide sustainably harvested; certified or labeled in accordance with **[FSC] [SFI] [CSA]** guidelines.

b. Salvaged Lumber:Lumber from deconstruction or demolition of existing buildings or structures. Unless otherwise noted, salvaged lumber shall be delivered clean, denailed, and free of paint and finish materials, and other contamination.

c. Recovered Lumber: Previously harvested lumber pulled from riverbeds or otherwise abandoned. Unless otherwise noted, recovered lumber shall be delivered clean and free of contamination.

B. Engineered Wood Products:
1. Toxicity/IEQ:
a. Products shall contain no added urea-formaldehyde.

2.2 ACCESSORIES

A. Adhesive:
1. Toxicity/IEQ: Comply with applicable regulations regarding toxic and hazardous materials, GS-36 for Commercial Adhesive, **[South Coast Air Quality Management District Rule 1168] [Bay Area AQMD Reg. 8, Rule 51 for containers larger than 16 oz and with California Air Resources Board (CARB) for containers 16 oz or less],** and as specified.

B. Fasteners:
1. Recycled Content: Fabricated from 100 percent re-melted steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install as indicated and in accordance with the National Association of Home Builders (NAHB) Advanced Framing Techniques: Optimum Value Engineering.

3.X SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality:
1. Temporary ventilation: Provide temporary ventilation during work of this Section.
a. During and immediately after installation of treated wood, engineered wood products, and laminated wood products at interior spaces, provide temporary ventilation.

B. Waste Management: As specified in Section 01 74 19 (01351) – Construction Waste Management and as follows:
1. Select lumber sizes to minimize waste; reuse scrap lumber to the greatest extent possible. Clearly separate scrap lumber for use on site as accessory components, including: shims, bracing, and blocking.
2. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill. Prevent saw dust and wood shavings from entering the storm drainage system.
3. Do not burn scrap lumber that has been pressure treated.
a. Do not send lumber treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

END OF SECTION

SECTION 06 20 00

CARPENTRY

For listing of subsections, see subsection index at end of

section. PART 1 - GENERAL

1.01 DESCRIPTION:

A. Furnish and install the necessary materials to do finished carpentry as indicated and as specified.

1.02 RELATED WORK:

A. Section 09941: Field Painting

1.03 REFERENCES:

A. Federal Specifications:

1. TT-W-535C, Wood Preservative: Fluorchrome Arsenate Phenol Mixture.

2. TT-W-571I(2), Wood Preservation: Treating Practices.

B. American Wood Preserver's Association Standard for wood Pressure Treated with Water-Borne Preservatives, P5-78.

1.04 SUBMITTALS:

A. Treated Wood: Certificates of Compliance

1.05 DELIVERY, STORAGE, AND HANDLING: Deliver to jobsite and store off the ground in a manner to ensure proper drainage, ventilation, and protection from the weather.

PART 2 - PRODUCTS

2.01 LUMBER MATERIALS:

A. Provide lumber of grades and species indicated below for various uses listed:

1. Nailers, cant strips and blocking: Standard grade

a. Douglas Fir, coast and inland.

b. Fir, white

c. Hemlock, eastern and west coast

d. Spruce, eastern, Engelmann's and Sitka

B. Sizes indicated are nominal.

C. Dress four sides of lumber used in finish work.

D. Moisture content of lumber:

1. Kiln dried lumber not over 2-in. nominal thickness: Not to exceed 19 percent.

2. Lumber over 2-in. nominal thickness, not kiln dried: To conform to the rules of the association under which it is graded. Incorporate into structure without further seasoning.

2.02 WOOD PRESERVATIVES:

A. For wood encased in or in contact with concrete or masonry, and wood items incorporated in the roofing, use preservatives conforming to following:

1. AWPA standard P5-78

2. Federal Specification TT-W-

535C PART 3 - EXECUTION

3.01 INSTALLATION:

A. Securely fasten and neatly fit carpentry with screws, nails, bolts, or spikes of ample size and suitable type.

1. Secure wood work to masonry or other hard surfaces with expansion bolts and plugs or shield in a manner to provide rigid and permanent support.

2. Countersink screws and bolts. Putty holes and sand smooth.

B. Wood Nailers, Cants and Blocking:

1. Anchor wood nailers with bolts and spike cant strips to nailer, as indicated, at edges of roofs and around roof openings.

2. Install wood nailers in concrete bases under metal lockers.

3. Provide wood blocking for base flashing and for pipe penetrations through roof, as indicated.

C. Wood Preservatives:

1. Apply preservatives in accordance with Federal Specification TT-W-571I(2), Treating Practices, Table III, Obtain notarized certificate of treatment from treatment company.

2. Prior to treatment, ensure that lumber is sawed to exact length and bored as required insofar as practicable.

3. Apply two heavy coats of preservative to any surfaces cut or bored after treatment, prior to installation.

PART 4 - SUBSECTION INDEX

A. GENERAL

1.01 Description
1.02 Related Work
1.03 References
1.04 Submittals
1.05 Delivery, Storage and Handling

B. PRODUCTS

2.01 Lumber Materials
2.02 Wood Preservatives

C. EXECUTION

3.01 Installation

END OF SECTION

DIVISION 7 – THERMAL & MOISTURE PROTECTION

SECTION 07 10 00
DAMPPROOFING AND WATERPROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fluid-applied dampproofing.

B. Fluid-applied waterproofing.

1.2 REFERENCES

A. ASTM International (ASTM):
1. ASTM C836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
2. ASTM D412 - Tests for Rubber Properties in Tension
3. ASTM D1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
4. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
5. ASTM D4479 - Standard Specification for Asphalt Roof Coatings - Asbestos-Free.
6. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
7. ASTM E96 - Water Vapor Transmission of Materials.

B. Federal Specifications:
1. MIL-R-3472 Roof Coating, Asphalt Base Emulsion.
2. SS-A-694 Asphalt Roof Coating (Brushing & Spraying Consist).
3. SS-C-153 - Cement, Bituminous, Plastic.
4. SS-R-1781 - Roof-Coating, Asphalt-Base Emulsion.
5. SS-W-110 - Water-Repellent Colorless, Silicone Resin Base.

C. National Standard of Canada 37.58 - M86.

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Warranty: Submit a sample warranty identifying the terms and conditions stated in Warranty article.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Applicator shall be experienced in applying the same or similar materials.

B. Regulatory Requirements: Comply with applicable codes, regulations, ordinances, and laws regarding use and application of products that contain volatile organic compounds (VOC).

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship is approved by Architect.
3. Rebuild mock-up area as required to produce acceptable work.

1.5 PRE-INSTALLATION MEETINGS

A. Pre-Installation Conference: Prior to beginning work, convene a conference to review conditions, installation procedures, schedules and coordination with other work.

B. Convene minimum two weeks prior to starting work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.
1. Name of material.
2. Manufacturer's stock number and date of manufacture.

B. Store materials in protected and well ventilated area. Handle materials to avoid damage.

1.7 PROJECT CONDITIONS

A. Do not apply when surface temperature or weather conditions conflict with manufacturer's published requirements.

B. Coordinate waterproofing work with other trades.

C. Keep flammable products away from spark or flame. Do not allow the use of spark producing equipment during application and until all vapors have dissipated. Post "NO SMOKING" signs.

D. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

1.8 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 WARRANTY

A. Warranty: Provide manufacturer's standard limited material warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Substitutions: See instructions on the Drawing Set.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before work is started, applicator shall thoroughly examine all surfaces for any deficiencies.

B. Notify Architect in writing of any defects.

3.2 SURFACE PREPARATION

A. Surface should be free of oil, grease, dirt, laitance and loose material.

B. Repair all cracks and holes as recommended by Manufacturer, before applying surface coating.

3.3 APPLICATION

A. Comply with manufacturer recommendations and approved submittals. Mix as recommended by manufacturer.

B. For fabric reinforced applications, apply first coat. Apply reinforcing fabric over the wet coating, overlapping all edges. Smooth out all wrinkles, to ensure there is no trapped air beneath fabric. Apply second coat.

END OF SECTION

SECTION 07 21 26

BLOWN INSULATION
THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Spray-in-place semi-rigid open-cell polyurethane foam insulation in assemblies indicated on the Drawings, to provide an air barrier and improved thermal resistance. (SEALECTION 500) (Demilec APX 1.2) (Agribalance).

B. Spray-in-place rigid closed-cell polyurethane foam insulation in assemblies indicated on the Drawings, to provide an air barrier and improved thermal resistance. (HEATLOK SOY 200 PLUS) (HEATLOK XT) (HEATLOK HFO High-Lift) (HEATLOK HFO Pro).

C. Water based intumescing coating. (BLAZELOK IB4) (BLAZELOK TBX) (DC315).

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 03 41 16 - Precast Concrete Slabs.

C. Section 04 20 00 - Unit Masonry.

D. Section 05 30 00 - Metal Decking.

E. Section 05 40 00 - Cold-Formed Metal Framing.

F. Section 06 10 00 - Rough Carpentry.

G. Section 07 10 00 - Dampproofing and Waterproofing.

H. Section 07 26 00 - Vapor Retarders.

I. Section 07 40 00 - Roofing and Siding Panels.

J. Section 07 65 26 - Self-Adhering Sheet Flashing.

K. Section 07 80 00 - Fire and Smoke Protection.

L. Section 07 84 53 - Building Perimeter Firestopping .

M. Section 09 22 16.13 - Non-Structural Metal Stud Framing.

N. Section 09 29 00 - Gypsum Board.

1.3 REFERENCES

A. ASTM International (ASTM):
1. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
2. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
3. ASTM D 1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

4. ASTM D 1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
5. ASTM D 1623 - Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
6. ASTM D 2856 - Standard Test Method for Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer.
7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
9. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
10. ASTM E 413 - Classification for Rating Sound Insulation.

B. Canadian General Standards Board (CGSB) 51.23 - Spray Applied Rigid Polyurethane Cellular Plastic Thermal Insulation.

C. International Code Council - International Residential Code:
1. Section 103.7 - Alternate Materials and Methods.
2. 2006 IRC Section R314 - Foam Plastic Insulation.
3. 2009, 2012, and 2015 IRC Section R316 - Foam Plastic Insulation.
4. Section 806.4 - Unvented Attic Assemblies.

D. International Code Council - International Building Code:
1. Section 104.11 Alternative materials, design and methods of construction and equipment.
2. Section 2603 Foam Plastic Insulation.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Before commencing work, submit in accordance with local code:
1. Technical data sheet from the manufacturer showing the test results from the ASTM E84 (Surface Burning Characteristics).
2. Other technical data sheets and samples as required by local code officials.

C. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Contractor performing work under this section shall be trained by Demilec in applying spray polyurethane foam insulation.
2. Provide current Demilec Authorized Contractor Certification.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until installation is approved by Architect.
3. Rework mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered in manufacturer's original containers clearly labeled with

manufacturer's name, product identification, safety information, net weight of contents and expiration date.

B. Material shall be stored in a safe manner and where the temperatures are in the limits specified by the material manufacturer.

C. Empty containers shall be removed from site on a daily basis.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Ventilate area to receive insulation to maintain safe working conditions.

C. Protect workers as recommended by standards and manufacturer's recommendations.

D. Protect adjacent surfaces, windows, equipment and site areas from damage of overspray.

1.8 WARRANTY

A. Manufacturer's Warranty: Demilec warrants spray-in-place urethane foam insulation, when installed by authorized contractors using factory-trained applicators and applied in accordance to the Installation Instructions, will perform as stated in the Product Technical Data Sheet.
   1. This warranty is in effect throughout the life of the building provided the original purchaser registers with the Warranty Department of the Manufacturer within thirty days of occupancy.
   2. Manufacturer's sole responsibility under this Limited Lifetime Warranty shall be to repair or replace any defective Product at the cost of the material only.
   3. Manufacturer shall not be responsible for labor cost or any other costs whatsoever related to, or in connection with the removal or installation of either the original or replacement product.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Demilec, which is located at: 3315 E. Division St.; Arlington, TX 76011; Toll Free Tel: (888) 261-7705; Tel: (817) 640-4900; Email:buildingscience@demilec.com; Web:https://www.demilec.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 SPRAY FOAM INSULATION

A. Spray Applied Semi Rigid Polyurethane Open Cell Foam Insulation System:
   1. Product: SEALECTION 500 manufactured by Demilec, Arlington, TX.
   2. Product Approval:
      a. International Code Council Evaluation Services Report #1172.
         1) Approved for building types I, II, III, IV, & V.
      b. Passed NFPA 286 in accordance with IBC 803.2.
      c. Warnock Hersey Evaluation # 193-7081.
      d. CCMC Evaluation # 12697-R.

3. Installation:
    a. Application with a prescriptive Thermal Barrier:
        1) Up to 9-1/4 inches (235 mm) for wall cavities and 14 inches (356 mm) in floors or ceilings with 1/2 inch gypsum wall board or equivalent 15 minute thermal barrier in accordance with IBC 2603.4 or IRC R316.4.
    b. Application without a Thermal or Ignition Barrier (exposed foam)
        1) Up to 7-1/2 inches (191 mm) in walls and 11-1/2 inches (292 mm) in floors and ceilings with all foam surfaces covered with 11 dry mils (17 wet mils) of BLAZELOK TBX.
    c. Attics and Crawlspaces: Passed AC 377 Appendix X compliant NFPA 286.
        1) Application with BLAZELOK IB4 Intumescent Coating:
            a) Up to 9-1/2 inches (241 mm) on vertical surfaces and 11-1/2 inches (292 mm) on the underside of the top of the space with all foam surfaces covered with a minimum nominal thickness of 3 dry mils (0.08 mm) (5 wet mils (0.13 mm)) of BLAZELOK IB4.
            b) Refer to ESR 1172 Section 4.3 Thermal Barrier.
    d. Use on Attic Floors:
        1) Applied between and over the joists in an attic floor.
            a) Up to 14 inches (356 mm).
            b) SEALECTION 500 may be left exposed without an intumescent coating in accordance with ASTM E 970.
    e. One-Hour Fire-Resistance-Rated Wall Assemblies: Non load-bearing.
        1) Refer to ESR1172 Section 4.5.
    f. Exterior Walls of Type I, II, III, and IV.
        1) Up to 3-5/8 inches (92 mm).
    g. Non load-bearing NFPA 285-tested Wall Assembly.
        1) Refer to ESR 1172 Section 4.6.1.
4. Physical Properties:
    a. Density (ASTM D 1622): 0.45 - 0.5 lb/cf (0.007 to 0.008 gm/cu. cm).
    b. Thermal Resistance (ASTM C 518):
        1) R-3.81 (sf.h degree F/BTU) at 1 inch at 90 days at 76 degree F (24.4 degree C).
        2) Refer to ESR 1172 for R-value table.
    c. Air Leakage (ASTM E 283-04):
        1) 3.5 inches (89 mm) At 75 Pa (25 mph wind): 0.001 L/s•m².
        2) 5.5 inches (140 mm) At 75 Pa (25 mph wind): 0.001 L/s•m².
        3) 10 inches (254 mm) At 75 Pa (25 mph wind): 0.002 L/s•m².
        4) Sustained Wind Load for 60 minutes At 1000 Pa (90 miles/hr. wind): No Damage.
        5) Gust Wind Load Test at 3000 Pa (160 miles/hr.): No Damage.
    d. Compressive Strength (ASTM D 1621): 0.7 psi (4.83 kPa).
    e. Tensile Strength (ASTM D 1623): 5.6 lbf/sq. inch (38.6 kPa).
    f. Sound Transmission Class (STC) (ASTM E 413-87 1999): 49-51. Based on Specific wall design.
    g. Noise Reduction Coefficient (NRC) (ASTM C 423): .75.
    h. Water Vapor Transmission (ASTM E 96):
        1) 3.5 inches (89 mm): 6.6 Perms.
        2) 5.5 inches (140 mm): 4.2 Perms.
        3) 7 inches (178 mm): 3.3 Perms.
        4) 10 inches (254 mm): 2.3 Perms.
    i. Off Gassing Tests (VOC Emissions) CGSB 51.23-92: Pass or compliant (No toxic vapors).
    j. Surface Burning Characteristics (ASTM E 84) 6 inches (152 mm): Class I. Flame Spread Index 21, Smoke Developed Index 216.
5. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.

6. Equipment used to apply the water based intumescing coating shall be an airless sprayer approved by the manufacturer.

B. Spray Applied Semi Rigid Polyurethane Foam Insulation System: (Open Cell Foam):
   1. Product: Demilec APX 1.2 manufactured by Demilec, Arlington, TX.
   2. Product Approval:
      a. International Code Council Evaluation Services Report #3470.
      b. Passed NFPA 286 in accordance with IBC 803.2 as an interior finish. Refer to section 3.b.1 of this specification for assembly details.
   3. Installation:
      a. Application with a prescriptive Thermal Barrier:
         1) Demilec APX 1.2 spray foam insulation must be separated from the interior of the building by an approved thermal barrier of 1/2 inch-thick (12.7mm) gypsum wallboard or an equivalent 15-minute thermal barrier complying with, and installed in accordance with, IBC 2603.4 of IRC 316.4, as applicable, except where insulation is in an attic or crawl space as described in section 4.4 of ESR #3470, Demilec APX 1.2 foam thickness is not limited when the insulation is separated from the interior of the building by an approved thermal barrier, based on fire testing in accordance with NFPA 286 and AC377.
      b. Application without a Thermal Barrier (exposed foam):
         1) The prescriptive 15-minute thermal barrier or ignition barrier may be omitted when installation is in accordance with this section. Demilec APX 1.2 Spray foam insulation and BLAZELOK TBX intumescent coating may be spray-applied to the interior facing of the walls and the underside of roof sheathing or roof rafters, and in crawl spaces, and may be left exposed as an interior finish without a prescribed 15-minute thermal barrier or ignition barrier. The foam plastic insulation thickness must not exceed 7-1/2 inches (191 mm) in walls and 11-1/2 inches (292 mm) in floors and ceilings. All foam surfaces must be covered with an 11-mil dry thickness (0.28 mm) [17 mils wet thickness (0.43 mm) of BLAZELOK TBX intumescent coating. The intumescent coating must be sprayed applied over the insulation in accordance with the coating manufacturer's instructions at a rate of 85 square feet per gallon (2.09m2/L).
         2) Refer to ESR 3470 Section 4.3 Thermal Barrier.
      c. Attics and Crawlspaces: Passed AC 377 Appendix X compliant NFPA 286:
         1) The insulation may be spray-applied to the underside of the roof sheathing and/or rafters, to the underside of wood floors and to vertical surfaces as described in this section. The thickness of the foam plastic applied to the underside of the top of the space must not exceed 11-3/4 inches (298 mm), and the thickness when applied to vertical surfaces must not exceed 7-3/4 inches (197 mm). The insulation does not require an ignition barrier or coating.
      d. Use on Attic Floors:
         1) Up to 11-3/4 inches (298 mm) between and over the joists in an attic floor without an ignition barrier, coating or covering.
   4. Physical Properties:
      a. Density (ASTM D 1622): 0.45 - 0.5 lb/cf (7.2 - 8 Kg/m3).
      b. Thermal Resistance (ASTM C 518):
         1) R-3.7 (sf.h degree F/BTU) at 1 inch (25 mm).
         2) Refer to ESR 3470 for R-value table.
      c. Air Leakage (ASTM E 283-04): 3.5 inches (89 mm) At 75 Pa (25 mph wind): 0.003 L/s•m².
      d. Compressive Strength (ASTM D 1621): 1.1 psi.
      e. Tensile Strength (ASTM D 1623): 3.7 lbf/sq. inch.
      f. Water Vapor Transmission (ASTM E 96): 1.008 inches (25 mm): 16.0 perms

g. Off Gassing Tests (VOC Emissions) Berkeley Analytical Certificate 130104-01: Pass or Compliant (No toxic vapors).
h. Surface Burning Characteristics (ASTM E 84) 4 inches (117 mm): Class I. Flame Spread Index 15, Smoke Developed Index 350.

5. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.
6. Equipment used to apply the water based intumescing coating shall be an airless sprayer approved by foam manufacturer.

C. Spray Applied Semi Rigid Polyurethane Foam Insulation System: (Open Cell Foam):
1. Product: Agribalance manufactured by Demilec, Arlington, TX.
2. Product Approval:
a. International Code Council Evaluation Services Report #2600.
1) Approved for Building Type V-B construction under IBC and Dwellings under IRC.
2) VAR 1006:
a) 10 percent Biobased Content per ASTM D 6886.
b. Passed AC 377 Appendix X compliant NFPA 286.
3. Installation:
a. Application with a prescriptive Thermal Barrier:
1) Up to 9-1/4 for wall cavities (235 mm) and 14 inches (356mm) in floors or ceilings with 1/2 inch gypsum wall board or equivalent 15 minute thermal barrier in accordance with IBC 2603.4 or IRC R316.4.
b. Attics and Crawl Spaces:
1) Application with BLAZELOK IB4 Intumescent Coating:
a) Up to 9-1/4 inches (235mm) on vertical surfaces and 11-1/4 inches (285.8mm) on the underside of the top of the space with all foam surfaces covered with a minimum nominal thickness of 5 dry mils (0.13mm) [9 wet mils (0.23mm)] of Blazelok IB4.
2) Application with HEATLOK SOY 200 PLUS Coating (See HEATLOK SOY 200 PLUS Tech Data and Specifications for more details).
a) Up to 5-1/2 inches (140mm) on vertical surfaces and 9-1/2 inches (241mm) on the underside of the top of the space with all foam surfaces covered with 2 inches (51mm) of HEATLOK SOY 200 PLUS spray polyurethane foam coating.
3) Application without a Thermal or Ignition Barrier (exposed foam).
a) Up to 5-1/2 Inches (191 mm) in walls and 11-1/2 inches (292 mm) in floors and ceilings with all foam surfaces covered with 15 dry mils, 23 wet mils of BLAZELOK TBX.
c. Use on Attic Floors:
1) Applied between and over the joists in an attic floor. All foam surfaces must be covered by one of the following intumescent coatings:
a) Up to 9-1/4 inches (235mm) covered by 5 dry mils (0.13mm) [9 wet mils (0.23mm)] BLAZELOK IB4
b) Up to 5-1/2 inches (140mm) covered 2 inches (51mm) by HEATLOK SOY 200 PLUS.
c) Refer to ESR 2600 Section 4.3 Thermal Barrier.
4. Physical Properties:
a. Density (ASTM D 1622): 0.60 - 0.80 lb/cf (0.0096 to 0.013 gm/cu. cm).
b. Thermal Resistance (ASTM C 518): R value per inch - 4.45 sf.h degree F/BTU.
c. Air Permeance (ASTM E 283): 3.5 inches (89 mm) thick.
1) At 500 Pa: 0.003 L/s•m².
2) At 1000 Pa: 0.006 L/s•m².
3) At 1500 Pa: 0.011 L/s•m².
4) At 2000 Pa: 0.018 L/s•m².
d. Compressive Strength (ASTM D 1621): 1.86 psi (12.9 kPa).

e. Tensile Strength (ASTM D 1623): 3.87 psi (26.7 kPa).
f. Vapor Permeance (ASTM E 96): 5 inches (127 mm): 4.95 Perms.
g. Surface Burning Characteristics (ASTM E 84) 6 inches (152 mm): Class I. Flame Spread Index 15 to 20, Smoke Developed Index 400.
h. Bio-based Solid Content (ASTM D 6866): 10%
i. Off Gassing Tests (VOC Emissions) Berkeley Analytical Certificate 130312-01: Pass or Compliant (No toxic vapors).

5. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.

D. Spray Applied Rigid Polyurethane Closed Cell Foam Insulation System:
1. Product: HEATLOK SOY 200 PLUS manufactured by Demilec, Arlington, TX
2. Product Approval:
a. International Code Council Evaluation Services Report #3210.
b. Approved for non-structural walls in building types I, II, III, IV, and V construction under IBC and dwellings for IRC.
c. Approved for exterior walls in building types I, II, III, and IV construction. (In progress.)
d. Passed AC 377 Appendix X compliant NFPA 286.
3. Installation:
a. Application with a prescriptive Thermal Barrier:
1) Up to 9-1/4 inches (235 mm) for wall cavities and 11-1/4 inches (286 mm) in floors or ceilings with 1/2 inch gypsum wall board or equivalent 15 minute thermal barrier in accordance with IBC 2603.4 or IRC R316.4.
b. Application without a Thermal or Ignition Barrier (exposed foam)
1) Up to 9-1/4 inches (235 mm) in walls and 11-1/4 inches (286 mm) in floors and ceilings with all foam surfaces covered with BLAZELOK TBX intumescent coating.
c. Application without a Thermal or Ignition Barrier (exposed foam)
1) Up to 5-1/2 inches (171 mm) in walls and 7-1/2 inches (190 mm) in floors and ceilings with all foam surfaces covered with 12 dry mils (18 wet mils) of BLAZELOK TBX intumescent coating.
2) Refer to ESR 3210 Section 4.3 Thermal Barrier.
d. Attics and Crawlspaces: Passed AC 377 Appendix X compliant NFPA 286.
1) Up to 7-1/2 inches (190.5 mm) on vertical surfaces and 11-1/2 (292 mm) inches on the underside of the space with no intumescent coating.
e. Use on Attic Floors:
1) Up to 7-1/4 inches (190.5 mm) between and over the joists in attic floors.
f. Use as Water-Resistive Barrier:
1) Minimum 1-1/2 inches (38 mm) continuous layer applied to suitable exterior substrate.
2) Refer to ESR # 3210 Section 4.5.
g. One-hour Fire-resistance-rated Wall Assembly: Nonload-bearing:
1) Refer to ESR #3210 Section 4.6.
4. Physical Properties:
a. Density (ASTM D 1622): 2.1 lb/ft3 (34 Kg/m3).
b. Thermal Resistance (ASTM C 518): Aged R value at 1 inch (180 days at 76 degrees F (23 degrees C)) - R-7.4 (sf.h degree F/BTU).
c. Water Vapor Permeance at 1.2 inches (ASTME 96-05): Less than 1 perms (is a vapor barrier per IBC Section 202 definitions at 1.2 inches)
d. Air Permeance at 75 Pa at 1 inch (ASTME 2178-03): 0.02 L/sm2.
e. Air Leakage of Air Barrier Assembly (static loading to 600 Pa and gust loading to 1,200 PA) Complies with ABAA requirements (ASTME 2357-05): Less than 0.02L/sm2 .
f. Compressive Strength (ASTM D 1621): 28.7 psi (198 kPa).
g. Tensile Strength (ASTM D 1623): 46.2 psi

h. Off Gassing Test (VOC Emissions) (CGSB 51.23-92): Pass (no toxic vapor).
i. Surface Burning Characteristics (ASTM E 84) 4 inches: Class I. Flame Spread Index 20, Smoke Developed Index 400.
j. Closed Cell Content (ASTM D2856) : Greater than 90%.

5. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.

E. Spray Applied Rigid Polyurethane Closed Cell Foam Insulation System:
1. Product: HEATLOK XT manufactured by Demilec, Arlington, TX
2. Product Approval:
a. International Code Council Evaluation Services Report 3824: HEATLOK XT-s.
b. International Code Council Evaluation Services Report 3883: HEATLOK XT-w.
c. Code Compliance Research Report, (CCRR) designed by Deer Ridge Consulting, Inc.
d. Approved for use in building types I, II, III, IV, and V construction under IBC and dwellings for IRC.
e. Approved for use in wall cavities, floor assemblies, ceiling assemblies, and attics and crawl spaces in Type VB construction under IBC and dwellings under IRC.
f. Passed AC 377 Appendix X compliant NFPA 286.
3. Installation:
a. Application with a prescriptive Thermal Barrier:
1) There is no thickness limit when installed in floors or ceilings behind 1/2 inch gypsum wall board or equivalent 15 minute thermal barrier in accordance with IBC 2603.4 or IRC R316.4.
b. Application without a Thermal or Ignition Barrier (exposed foam)
1) Up to 11-1/2 inches (292 mm) on the underside of the roof sheathing or in floor assemblies and 7-1/2 inches (191 mm) on vertical surfaces with all foam surfaces covered with 12 dry mils of DC-315 Fireproof Paint.
c. Application without a Thermal or Ignition Barrier (exposed foam)
1) Up to 11-1/2 inches (292 mm) on the underside of the roof sheathing or in floor assemblies and 7-1/2 inches (191 mm) on vertical surfaces with all foam surfaces covered with 12 dry mils (18 wet mils) of BLAZELOK TBX intumescent coating.
2) Refer to ESR 3824 & 3883 Section 4.3 Thermal Barrier.
d. Attics and Crawlspaces: Passed AC 377 Appendix X compliant NFPA 286.
1) Up to 11-1/2 inches (292 mm) on the underside of the roof sheathing or in floor assemblies and 7-1/2 inches (191 mm) on vertical surfaces, the insulation may be left exposed without a thermal barrier, ignition barrier or intumescent coating.
e. Use on Attic Floors:
1) Up to 11-1/2 inches (190.5mm) between and over the joists in attic floors.
f. Use as Vapor Retarder:
1) Class II vapor retarder at less than 1.0 perm, HEATLOK XT-s minimum thickness of 1.625 inches, HEATLOK XT-w minimum thickness of 1.10 inches.
4. Physical Properties:
a. Density (ASTM D 1622): 2.1 lb/ft3 (34 Kg/m3).
1) Summer: 2.23 lb/ft3 (34 Kg/m3).
2) Winter: 2.17 lb/ft3 (34 Kg/m3).
b. Thermal Resistance (ASTM C 518): Aged R value at 1 inch (180 days at 76 degrees F (23 degrees C)):
1) Summer: R 6.7 (sf.h degree F/BTU).
2) Winter: R 6.9 (sf.h degree F/BTU).
c. Water Vapor Permeance (ASTME 96-05):

1) Summer: At 1.625 inches, less than 1 perms.
2) Winter: At 1.1 inches, less than 1 perms.

d. Air Permeance at 75 Pa at 1 inch (ASTME 2178-03): 0.02 L/sm2.

e. Air Leakage of Air Barrier Assembly (static loading to 600 Pa and gust loading to 1,200 PA) Complies with ABAA requirements (ASTME 2357-05): Less than 0.02L/sm2 .

f. Compressive Strength (ASTM D 1621):
1) Summer: 18.0 psi (124 kPa).
2) Winter: 23.1 psi (139 kPa).

g. Tensile Strength (ASTM D 1623): 46.2 psi
1) Summer: 37.9 psi (261 kPa).
2) Winter: 53.7 psi (370 kPa).

h. Dimensional Stability (ASTM D 2126): percent volume change at 158 degrees F (70 degrees C) and 97 percent relative humidity:
1) Summer: 5.45 percent.
2) Winter: 4.14 percent.

i. Off Gassing Test (VOC Emissions) (Greenguard Gold): Pass, Meets Criteria.

j. Surface Burning Characteristics (ASTM E 84) 4 inches: Class I. Flame Spread Index 5:
1) Summer: Smoke Developed: 350-400.
2) Winter: Smoke Developed : 250-300.

k. Recycled Content:
1) Summer: 22.7 percent.
2) Winter: 21.0 percent.

l. Fungi Resistance (ASTM C 1338): No Fungal Growth.

m. Closed Cell Content (ASTM D2856) : Greater than 90%.

5. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.

F. Spray Applied Rigid Polyurethane Closed Cell Foam Insulation System:
1. Product: HEATLOK HFO High Lift manufactured by Demilec, Arlington, TX
2. Product Approval:
a. Code Compliance Research Report, (CCRR) designed by Deer Ridge Consulting, Inc.
b. Approved for use in building types I, II, III, IV, and V construction under IBC and dwellings for IRC.
c. Approved for use in wall cavities, floor assemblies, ceiling assemblies, and attics and crawl spaces in Type VB construction under IBC and dwellings under IRC.
d. Passed AC 377 Appendix X compliant NFPA 286.
3. Installation:
a. Application with a prescriptive Thermal Barrier:
1) There is no thickness limit when installed in floors or ceilings behind 1/2 inch gypsum wall board or equivalent 15 minute thermal barrier in accordance with IBC 2603.4 or IRC R316.4.
b. Application without a Thermal Barrier:
1) Up to 11-1/2 inches (292 mm) on the underside of the roof sheathing or in floor assemblies and 7-1/2 inches (191 mm) on vertical surfaces with all foam surfaces covered with a minimum of 12 mils DFT of DC-315 Fireproof Paint or a minimum of 12 mils DFT of Blazelok TBX.
c. Attics and Crawlspaces: Passed AC 377 Appendix X compliant NFPA 286.
1) Up to 11-1/2 inches (292 mm) on the underside of the roof sheathing or in floor assemblies and 7-1/2 inches (191 mm) on vertical surfaces, the insulation may be left exposed without a thermal barrier, ignition barrier or intumescent coating.
d. Use on Attic Floors:

1) Up to 11-1/2 inches (190.5mm) between and over the joists in attic floors.

e. Use as Vapor Retarder:
1) Class II vapor retarder at less than 1.0 perm, HEATLOK HFO High Lift minimum thickness of 0.7 inches.

4. Physical Properties:
a. R-Value/in at 4 inch (ASTM C518): 7.5 ft2hdegreesF/BTU.
b. R-Value/in at 1 inch (ASTM C518): 6.3 ft2hdegreesF/BTU.
c. R-Value at 6.5 inches (ASTM C518): 48 ft2hdegreesF/BTU.
d. R-Value at 4 inches (ASTM C518): 30 ft2hdegreesF/BTU.
e. R-Value at 2 inches (ASTM C518): 14 ft2hdegreesF/BTU.
f. Core Density (ASTM D 1622): 2.2 lb/ft3/
g. Water Vapor Permeance (ASTM E 96): Less than 1 perm at 0.7 inches.
h. Air Permeance at 75 Pa at 1inch (ASTM E 2178): Less than 0.02 L/sm2.
i. Air Leakage at 75 Pa at 1 inch (ASTM E 283): Less than 0.02 L/sm2.
j. Compressive Strength (ASTM D 1621): 34.8 lb/in2 (240 kPa).
k. Tensile Strength (ASTM D 1623): 101.3 lb/in2 (699 kPa).
l. Dimensional Stability (ASTM D 2126): 11.4 (% volume change) at 158 degrees F (70 degrees C) 97% R.H.
m. VOC Content, Greenguard Gold: PASS, Meets Criteria/
n. Flame Spread (ASTM E84): Class I, 0-15.
o. Smoke Developed (ASTM E84): Class I, 350 - 400.
p. Recycled Content, Finished Foam Renewable & Recycled Content: 12%.
q. Recycled Content, Polyol Renewable Content: 6%
r. Recycled Content, Polyol Recycled Content: 19%.
s. Fungi Resistance (ASTM C 1338): No Fungal Growth.
t. Closed Cell Content (ASTM D 2856): 91%.

5. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.

G. Spray Applied Rigid Polyurethane Closed Cell Foam Insulation System:
a. Product: HEATLOK HFO Pro manufactured by Demilec, Arlington, TX
b. Product Approval:
1) Evaluation Report #565 by UES
2) Approved for use in building types I, II, III, IV, and V construction under IBC and dwellings for IRC.
3) Approved for use in wall cavities, floor assemblies, ceiling assemblies, and attics and crawl spaces in Type VB construction under IBC and dwellings under IRC.
4) Passed AC 377 Appendix X compliant NFPA 286.

c. Installation:
1) Application with a prescriptive Thermal Barrier:
a) There is no thickness limit when installed in floors or ceilings behind 1/2 inch gypsum wall board or equivalent 15 minute thermal barrier in accordance with IBC 2603.4 or IRC R316.4.

2) Application without a Thermal Barrier:
a) Up to 11-1/2 inches (292 mm) on the underside of the roof sheathing or in floor assemblies and 7-1/2 inches (191 mm) on vertical surfaces with all foam surfaces covered with a minimum of 12 mils DFT of DC-315 Fireproof Paint or a minimum of 12 mils DFT of Blazelok TBX.

3) Attics and Crawlspaces: Passed AC 377 Appendix X compliant NFPA 286.
a) Up to 11-1/2 inches (292 mm) on the underside of the roof sheathing or in floor assemblies and 7-1/2 inches (191 mm) on vertical surfaces, the insulation may be left exposed without a

thermal barrier, ignition barrier or intumescent coating.

4) Use on Attic Floors:
   a) Up to 11-1/2 inches (190.5mm) between and over the joists in attic floors.
5) Use as Vapor Retarder:
   a) Class II vapor retarder at less than 1.0 perm, HEATLOK HFO Pro minimum thickness of 0.7 inches.

d. Physical Properties:
1) R-Value/in at 4 inch (ASTM C518): 6.5 ft2hdegreesF/BTU.
2) R-Value/in at 1 inch (ASTM C518): 7.4 ft2hdegreesF/BTU.
3) R-Value at 4 inches (ASTM C518): 26 ft2hdegreesF/BTU.
4) R-Value at 2 inches (ASTM C518): 14 ft2hdegreesF/BTU.
5) Core Density (ASTM D 1622): 2 lb/ft3/
6) Water Vapor Permeance (ASTM E 96): .91perms at 1 inch.
7) Air Permeance at 75 Pa at 1inch (ASTM E 2178): Less than 0.02 L/sm2.
8) Air Leakage at 75 Pa at 1 inch (ASTM E 283): Less than 0.02 L/sm2.
9) Compressive Strength (ASTM D 1621): 31 psi (214 kPa).
10) Tensile Strength (ASTM D 1623): 44 psi (1303 kPa).
11) Dimensional Stability (ASTM D 2126): 3.7 (% volume change) at 158 degrees F (70 degrees C) 97% R.H.
12) VOC Content, Greenguard Gold: PASS, Meets Criteria/
13) Flame Spread (ASTM E84): Class I, 12.
14) Smoke Developed (ASTM E84): Class I, 350 - 400.
15) Recycled Content, Finished Foam Renewable & Recycled Content: 12%.
16) Recycled Content, Polyol Renewable Content: 6%.
17) Recycled Content, Polyol Recycled Content: 19% .
18) Fungi Resistance (ASTM C 1338): No Fungal Growth.
19) Closed Cell Content (ASTM D 2856): 98%.

e. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.

2.3 ACCESSORY PRODUCTS

A. Water Based Intumescing Coating:
1. Product: BLAZELOK IB4, Distributed by Demilec, Manufactured by TPR2.
2. Approval: Complies with 2006 IRC 314.6, 2009 IRC 316.6, IBC 2603.9 and AC 377 over all surfaces of SEALECTION 500 for use without a prescriptive ignition barrier in attics and crawlspaces.
3. Application: Follow manufacturer's application recommendations.
4. Physical Properties:
   a. Surface Burning Characteristics (ASTM E 84): Class I. Flame Spread Index 0, Smoke Developed Index 20.
   b. Expands up to 2000 percent.
   c. Flash Point: None.
   d. Volatility/VOC: 0.
   e. Flexible, ductile, elastomeric.
   f. Non-toxic, drain safe, water based, non-fuming.
   g. Can be latex or oil base top coated.
5. Color: Gray.

B. Water Based Intumescing Coating:
1. Product: BLAZELOK TBX, Distributed by Demilec, Manufactured by TPR2.
2. Approval: Complies with 2009 IBC 2603.9 and 803.2; 2009 IRC 302.9.4 and 316.6; 2006 IRC 314.6 and 315.4 and the NFPA 101 paragraph 10.2.3.7.2 for use without a prescriptive thermal barrier.
3. Application: Follow manufacturer's application recommendations.

4. Physical Properties:
    a. Surface Burning Characteristics (ASTM E 84): Class I. Flame Spread Index less than 25, Smoke Developed Index less than 50.
    b. Expands up to 2000 percent.
    c. Flash Point: None.
    d. Volatility/VOC: Less than 50 g/L.
    e. Non-toxic, drain safe, water based, non-fuming.
    f. Can be latex or oil base top coated.
5. Color: Dull flat white / gray.
    a. Do not add tint.
    b. Wait minimum 24 hours prior to top coating with quality latex paint. Verify dryness with moisture meter.

C. Water Based Intumescing Coating:
1. Product: DC315 Intumescing Coating, Distributed by Demilec, Manufactured by International Fireproof Technologies, Inc. (IFTI).
2. Application: Follow manufacturer's application recommendations.
3. Physical Properties:
    a. Surface Burning Characteristics (ASTM E 84): Class I. Flame Spread Index of 0, Smoke Developed Index less than 25
    b. Expands up to 2000 percent.
    c. Flash Point: None.
    d. Volatility/VOC: Less than 50 g/L.
    e. Non-toxic, drain safe, water based, non-fuming.
4. Color: Dull flat / ice gray.
    a. Do not add tint.
    b. Wait minimum 24 hours prior to top coating with quality latex paint. Verify dryness with moisture meter.
5. Refer to products International Code Council Evaluation Services Report for additional Intumescent Coating information.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions. Apply as recommended by manufacturer to thickness as indicated on drawings.

B. Apply thermal barrier as required by applicable codes noting the following:
   1. Except as provided in Section 314.5 and Section 314.6 of the 2006 International Residential Code, Section 316.5 and Section 316.6 of the 2009 International Residential Code and Section 2603.4.1 and Section 2603.9 of the International Building Code, all plastic insulation shall be separated from the interior of the building by an approved thermal barrier of 1/2 inch (13 mm) gypsum wallboard or equivalent thermal barrier material.
   2. Code compliant fire protection may be achieved with the use of BLAZELOK IB4 and BLAZELOK TBX depending on the details of the application.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 60 00

FLASHING AND SHEET METAL

SPEC WRITER NOTES:

1. Delete or edit text in // // if not applicable to project. Also delete any other paragraph not applicable in the section.
2. This section requires close coordination with roofing and masonry sections for flashing installed by other trades and for flashings integral with manufactured metal roofing/wall systems where matching finish is required of the same material.
3. Coordinate with drawing terminology for correct and uniform nomenclature.
4. Follow the recommendations of the National Roofing Contractors Association "Roofing and Waterproofing Manual" for design criteria.
5. Modify this section to address reroofing of existing roofing system. Coordinate with Section 07 01 50.19 PREPARATION FOR REROOFING for reroofing of existing facilities.

PART 1 - GENERAL

1.1 DESCRIPTION

A. Formed sheet metal work for wall and roof flashing, copings, roof edge metal, fasciae, drainage specialties, and formed expansion joint covers are specified in this section.

1.2 RELATED WORK

SPEC WRITER NOTE: Edit Related Work to reflect other sections relating directly to this section or referenced in this section.

A. //Section 07 51 00, BUILT-UP BITUMINOUS ROOFING: Membrane base flashings and stripping.//
B. //Section 07 51 13.11 HOT-APPLIED BUILT-UP ASPHALT ROOFING: Membrane base flashings and stripping.//
C. //07 51 13.13 COLD-APPLIED BUILT-UP ASPHALT ROOFING Membrane base flashings and stripping.//
D. //Section 07 52 16.11 COLD ADHESIVE STYRENE-BUTADIENE-STYRENE MODIFIED BITUMINOUS MEMBRANE ROOFING Membrane base flashings and stripping.//
E. //07 52 16.12 HOT-MOPPED STYRENE-BUTADIENE-STYRENE MODIFIED BITUMINOUS MEMBRANE ROOFING Membrane base flashings and stripping.//
F. //Section 07 53 23 ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING Membrane base flashings and stripping.//
G. //Section 07 54 16 ETHYLENE INTERPOLYMER (KEE) ROOFING Membrane base flashings and stripping.//
H. //Section 07 54 19 POLYVINYL-CHLORIDE (PVC) ROOFING Membrane base flashings and stripping.//

I. //Section 07 54 23 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING: Membrane base flashings and stripping.//

J. Section 07 71 00 ROOF SPECIALTIES: Manufactured flashing, copings, roof edge metal, and fasciae.

K. //Section 07 71 00, ROOF SPECIALTIES: Integral flashing components of manufactured roof specialties and accessories or equipment.//

L. //Section 07 72 00, ROOF ACCESSORIES: Integral flashing components of manufactured roof specialties and accessories or equipment..//

M. Division 07 ROOFING AND WALL SYSTEM: Flashing components of factory finished roofing and wall systems.

N. Section 07 92 00, JOINT SEALANTS: Joint Sealants.

O. Section 09 06 00, SCHEDULE FOR FINISHES: Color of factory coated exterior architectural metal and anodized aluminum items.

P. Section 09 91 00, PAINTING: Paint materials and application.

Q. Section 13 34 19, METAL BUILDING SYSTEMS: Flashing and sheet metal in connection with prefabricated metal buildings.

R. : sections and sections.

S. //Division 22, PLUMBING: Integral flashing components of manufactured roof specialties and accessories or equipment.//

T. Section 22 14 00, FACILITY STORM DRAINAGE: Flashing of Roof Drains.

U. //Division 23 HVAC: Integral flashing components of manufactured roof specialties and accessories or equipment.

1.3 APPLICABLE PUBLICATIONS

SPEC WRITER NOTES:

1. Update applicable publications to current issue at time of project specification preparation.
2. Update material requirements to agree with applicable requirements (types, grades, classes,) specified in the referenced Applicable Publications.

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.

B. Aluminum Association (AA):

AA-C22A41..... Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick

AA-C22A42..... Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick

AA-C22A44 ..... Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class I Architectural, 0.7-mil thick finish

C. American National Standards Institute/Single-Ply Roofing Institute/Factory Mutual (ANSI/SPRI/FM):

4435/ES-1-11 ..... Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

D. American Architectural Manufacturers Association (AAMA):

AAMA 620-02 ..... Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum

AAMA 621-02 ..... Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates

E. ASTM International (ASTM):

A240/A240M-20..... Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A653/A653M-20..... Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process

B32-08(2014)..... Solder Metal

B209-14 ..... Aluminum and Aluminum-Alloy Sheet and Plate

B370-12(2019)..... Copper Sheet and Strip for Building Construction

D173/D173M-03(2018)..... Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing

D412-16..... Vulcanized Rubber and Thermoplastic Elastomers-Tension

D1187/D1187M-97(2018)..... Asphalt Base Emulsions for Use as Protective Coatings for Metal

D1784-20..... Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

D3656/D3656M-13 ..... Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

D4586/D4586M-07(2018)..... Asphalt Roof Cement, Asbestos Free

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.

G. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06..... Metal Finishes Manual

H. Federal Specification (Fed. Spec):

A-A-1925A ..... Shield, Expansion; (Nail Anchors)

UU-B-790A ..... Building Paper, Vegetable Fiber

I. International Code Commission (ICC): International Building Code, Current Edition

1.4 PERFORMANCE REQUIREMENTS

SPEC WRITER NOTE: Select applicable subparagraph below based upon FM Approvals 1-28, Table AC 1.4. Coordinate with uplift requirements of Division 07 roofing section.

A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
   1. Wind Zone 1: 0.48 to 0.96 kPa (10 to 20 pound force/square foot): 1.92-kPa (40 pound force/square foot) perimeter uplift force, 2.87-kPa (60 pound force/square foot pound force/square foot) corner uplift force, and 0.96-kPa (20- pound force/square foot) outward force.
   2. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 pound force/square foot): 2.87-kPa (60 pound force/square foot) perimeter uplift force, 4.31-kPa (90 pound force/square foot) corner uplift force, and 1.44-kPa (30 pound force/square foot) outward force.
   3. Wind Zone 2: 1.48 to 2.15 kPa (31 to 45 pound force/square foot): 4.31-kPa (90 pound force/square foot) perimeter uplift force, 5.74-kPa (120 pound force/square foot) corner uplift force, and 2.15-kPa (45 pound force/square foot) outward force.
   4. Wind Zone 3: 2.20 to 4.98 kPa (46 to 104 pound force/square foot): 9.96-kPa (208 pound force/square foot) perimeter uplift force, 14.94-kPa (312 pound force/square foot) corner uplift force, and 4.98-kPa (104 pound force/square foot) outward force.

SPEC WRITER NOTE: Standard below applies to shop-fabricated sheet metal copings and roof edge metal items tested under cited standard; it is a requirement of the current International Building Code. NRCA member firms are able to meet below utilizing NRCA-approved and tested details.

B. Wind Design Standard: Fabricate and install //copings// //roof-edge flashings// tested per ANSI/SPRI/FM ES-1 to resist design pressure //insert design pressure// //indicated on Drawings//.

1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

SPEC WRITER NOTE: Add to shop drawing list special items not specified in this section that are added to this section.

B. Shop Drawings: For all specified items, including:
   1. Flashings
   2. Copings
   3. Gravel Stop-Fascia
   4. Gutter and Conductors
   5. Expansion joints
   6. Fascia-cant

C. Manufacturer's Literature and Data: For all specified items, including:

1. Two-piece counterflashing
2. Thru wall flashing
3. Expansion joint cover, each type
4. Nonreinforced, elastomeric sheeting
5. Copper clad stainless steel
6. Polyethylene coated copper
7. Bituminous coated copper
8. Copper covered paper
9. Fascia-cant

D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

PART 2 - PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS

SPEC WRITER NOTE: Retain paragraphs below that correspond to project requirements.

A. Stainless Steel: ASTM A240, Type 302B, dead soft temper.

B. Copper ASTM B370, cold-rolled temper.

C. Bituminous Coated Copper: Minimum copper ASTM B370, weight not less than 1 kg/m² (3 oz/sf). Bituminous coating shall weigh not less than 2 kg/m² (6 oz/sf); or, copper sheets may be bonded between two layers of coarsely woven bitumen-saturated cotton fabric ASTM D173. Exposed fabric surface shall be crimped.

D. Copper Covered Paper: Fabricated of electro-deposit pure copper sheets ASTM B 370, bonded with special asphalt compound to both sides of creped, reinforced building paper, UU-B-790, Type I, style 5, or to a three ply sheet of asphalt impregnated crepe paper. Grooves running along the width of sheet.

E. Polyethylene Coated Copper: Copper sheet ASTM B370, weighing 1 Kg/m² (3 oz/sf) bonded between two layers of (two mil) thick polyethylene sheet.

F. Aluminum Sheet: ASTM B209, alloy 3003-H14 //except alloy used for color anodized aluminum shall be as required to produce specified color. Alloy required to produce specified color shall have the same structural properties as alloy 3003-H14//.

G. Galvanized Sheet: ASTM, A653.

H. Nonreinforced, Elastomeric Sheeting: Elastomeric substances reduced to thermoplastic state and extruded into continuous homogenous sheet (0.056 inch) thick. Sheeting shall have not less than 7 MPa (1,000 psi) tensile strength and not more than seven percent tension-set at 50 percent elongation when tested in accordance with ASTM D412. Sheeting shall show no cracking or flaking when bent through 180 degrees over a 1 mm (1/32 inch) diameter mandrel and then bent

at same point over same size mandrel in opposite direction through 360 degrees at temperature of -30°C (-20 °F).

2.2 FLASHING ACCESSORIES

A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.

B. Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m² (6 pounds/100 square feet).

C. Bituminous Paint: ASTM D1187, Type I.

D. Fasteners:

1. Use copper, copper alloy, bronze, brass, or stainless steel for copper and copper clad stainless steel, and stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.
2. Nails:
   a. Minimum diameter for copper nails: 3 mm (0.109 inch).
   b. Minimum diameter for aluminum nails 3 mm (0.105 inch).
   c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
   d. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.
3. Rivets: Not less than 3 mm (1/8 inch) diameter.
4. Expansion Shields: Fed Spec A-A-1925A.

E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.

F. Insect Screening: ASTM D3656, 18 by 18 regular mesh.

G. Roof Cement: ASTM D4586.

2.3 SHEET METAL THICKNESS

A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:

B. Concealed Locations (Built into Construction):

1. Copper: 30g (10 oz) minimum 0.33 mm (0.013 inch thick).
2. Stainless steel: 0.25 mm (0.010 inch) thick.
3. Copper clad stainless steel: 0.25 mm (0.010 inch) thick.
4. Galvanized steel: 0.5 mm (0.021 inch) thick.

C. Exposed Locations:

1. Copper: 0.4 Kg (16 oz).
2. Stainless steel: 0.4 mm (0.015 inch).
3. Copper clad stainless steel: 0.4 mm (0.015 inch).

D. Thickness of aluminum or galvanized steel is specified with each item.

2.4 FABRICATION, GENERAL

A. Jointing:
   1. In general, copper, stainless steel and copper clad stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
   2. Jointing of copper over 0.5 Kg (20 oz) weight or stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.
   3. Joints shall conform to following requirements:
      a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.
      b. Lap joints subject to stress shall finish not less than 25 mm (one inch) wide and shall be soldered and riveted.
      c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.
   4. Flat and lap joints shall be made in direction of flow.
   5. Edges of bituminous coated copper, copper covered paper, nonreinforced elastomeric sheeting and polyethylene coated copper shall be jointed by lapping not less than 100 mm (4 inches) in the direction of flow and cementing with asphalt roof cement or sealant as required by the manufacturer's printed instructions.
   6. Soldering:
      a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) of uncoated copper, stainless steel, and copper clad stainless steel.
      b. Wire brush to produce a bright surface before soldering lead coated copper.
      c. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
      d. Completely remove acid and flux after soldering is completed.

B. Expansion and Contraction Joints:
   1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
   2. Space joints as shown or as specified.
   3. Space expansion and contraction joints for copper, stainless steel, and copper clad stainless steel at intervals not exceeding 7200 mm (24 feet).
   4. Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
   5. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
   6. Fabricate joint covers of same thickness material as sheet metal served.

C. Cleats:
   1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
   2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.

3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

D. Edge Strips or Continuous Cleats:
1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.
2. Except as otherwise specified, fabricate edge strips or minimum //0.6 Kg (24 ounce) copper// //0.6 mm (0.024 inch) thick stainless steel// //1.25 mm (0.050 inch) thick aluminum//.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using //1 Kg (32 oz) copper// //0.8 mm (0.031 inch) thick stainless steel// //1.6 mm (0.0625 inch) thick aluminum//.

E. Drips:
1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

F. Edges:
1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
3. All metal roof edges shall meet requirements of IBC, current edition.

SPEC WRITER NOTE: For alteration work and small projects, minimize number of specified optional flashing materials. Match existing metals.

G. Metal Options:
1. Where options are permitted for different metals use only one metal throughout.

2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.
3. Where copper gravel stops, copings and flashings will carry water onto cast stone, stone, or architectural concrete, or stainless steel.

2.5 FINISHES

SPEC WRITER NOTES:
1. If more than one finish is used on project, precede finish spec with "Finish for (list items): "Following items are of aluminum: Coping, Gravel Stop and Fascia-Cant, Exp. Jt. Cover, Gutter and Downspout.
2. Coordinate with Section 09 06 00, SCHEDULE FOR FINISHES and drawings clearly identify locations of different colors or finish on the same item.

A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
C. Finish exposed metal surfaces as follows, unless specified otherwise:
    1. Copper: Mill finish.
    2. Stainless Steel: Finish No. 2B or 2D.
    3. Aluminum:
        a. Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1 Architectural, 18 mm (0.7 mils) thick.
        b. Colored Finish: AA-C22A42 (anodized) or AA-C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1 Architectural, 18 mm (0.7 mils) thick. Dyes will not be accepted.
        c. Fluorocarbon Finish: AAMA 620, high performance organic coating.
        d. Mill finish.
    4. Steel and Galvanized Steel:
        a. Finish painted under Section 09 91 00, PAINTING unless specified as prefinished item.
        b. Manufacturer's finish:
            1) Baked on prime coat over a phosphate coating.
            2) Baked-on prime and finish coat over a phosphate coating.
            3) Fluorocarbon Finish: AAMA 621, high performance organic coating.

2.6 THROUGH-WALL FLASHINGS

SPEC WRITER NOTES:

1. See Sheet Metal Manual for wall flashings. Provide drips on drainage sides.
2. Clearly detail flashings at copings, building set-backs, sills, spandrels, lintels, and grade.
3. Coordinate with waterproofing or dampproofing to show interface.

A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.
    1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
    2. Fabricate so keying nests at overlaps.
B. For Masonry Work When Concealed Except for Drip:
    1. Either copper, stainless steel, or copper clad stainless steel.
    2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
    3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.
C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:
    1. Use same metal and thickness as counter flashing.
    2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
    3. Form exposed portion as snap lock receiver for counter flashing upper edge.
D. For Flashing at Architectural Precast Concrete Panels or Stone Panels.
    1. Use plan flat sheet of stainless steel.
    2. Form exposed portions with drip as specified or receiver.
E. Window Sill Flashing and Lintel Flashing:
    1. Use either copper, stainless steel, copper clad stainless-steel plane flat sheet, or nonreinforced elastomeric sheeting, bituminous coated copper, copper covered paper, or polyethylene coated copper.
    2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
    3. Turn up back edge as shown.
    4. Form exposed portion with drip as specified or receiver.
F. Door Sill Flashing:
    1. Where concealed, use either 0.5 Kg (20 ounce) copper, 0.5 mm (0.018 inch) thick stainless steel, or 0.5 mm (0.018 inch) thick copper clad stainless steel.
    2. Where shown on drawings as combined counter flashing under threshold, sill plate, door sill, or where subject to foot traffic, use either 0.6 Kg (24 ounce) copper, 0.6 mm (0.024 inch) stainless steel, or 0.6 mm (0.024 inch) thick stainless steel.
    3. Fabricate flashing at ends to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening with folded corners.

SPEC WRITER NOTE: Do not use galvanized steel for base flashing.

2.7 BASE FLASHING

A. Use metal base flashing at vertical surfaces intersecting built-up roofing without cant strips or where shown.
   1. Use either copper, or stainless steel, thickness specified unless specified otherwise.
   2. When flashing is over 250 mm (10 inches) in vertical height or horizontal width use either 0.5 Kg (20 oz) copper or 0.5 mm (0.018 inch) stainless steel.
   3. Use stainless steel at aluminum roof curbs where flashing contacts the aluminum.
   4. Use either copper, or stainless steel at pipe flashings.

B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).

C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.

D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.

E. Pipe Flashing: (Other than engine exhaust or flue stack)
   1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
   2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
   3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
      a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
      b. Allow for loose fit around and into the pipe.
   4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
      a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
      b. Allow for loose fit around pipe.

2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)

SPEC WRITER NOTES:

1. Galvanized steel is not desired due to maintenance, especially painting, if used specify 0.6 mm (0.023 inch) thick material for counter flashing.
2. Use 1.25 mm (0.050 inch) thick aluminum for counter flashing.
3. Identify clearly locations of different metals if used for same item.

A. Either copper or stainless steel, unless specified otherwise.

B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:

1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
4. Manufactured assemblies may be used.
5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.

C. One-piece Counterflashing:
1. Back edge turned up and fabricate to lock into reglet in concrete.
2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).

D. Two-Piece Counterflashing:
1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
2. Counterflashing upper edge designed to snap lock into receiver.

E. Surface Mounted Counterflashing; one or two piece:
1. Use at existing or new surfaces where flashing cannot be inserted in vertical surface.
2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.
3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.

F. Pipe Counterflashing:
1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
2. Fabricate 100 mm (4 inch) over lap at end.
3. Fabricate draw band of same metal as counter flashing. Use 0.6 Kg (24 oz) copper or 0.33 mm (0.013 inch) thick stainless steel or copper coated stainless steel.
4. Use stainless steel bolt on draw band tightening assembly.
5. Vent pipe counter flashing may be fabricated to omit draw band and turn down 25 mm (one inch) inside vent pipe.

G. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

2.9 GRAVEL STOPS

A. General:
   1. Fabricate in lengths not less than 2400 mm (8 feet) long and maximum of 3000 mm (10 feet).
   2. Fabricate internal and external corners as one-piece with legs not less than 600 mm (2 feet) or more than 1200 mm (4 feet) long.
   3. Fabricate roof flange not less than 100 mm (4 inches) wide.
   4. Fabricate top edge to extend above roof not less than 25 mm (one inch) for embedded gravel aggregate and not less than 100 mm (4 inches) for loose laid ballast.
   5. Fabricate lower edge outward at an angle of 45 degrees to form drip and as fascia or as counter flashing as shown:
      a. Fabricate of one-piece material of suitable width for fascia height of 250 mm (10 inch) maximum or counterflashing lap of not less than 100 mm (4 inch) over base flashing.
      b. Fabricate bottom edge of formed fascia to receive edge strip.
      c. When fascia bottom edge forms counter flashing over roofing lap roofing not less than 150 mm (6 inches).

B. Formed Flat Sheet Metal Gravel Stops and Fascia:
   1. Fabricate as shown of //.05 mm (0.018 inch) thick stainless steel// //0.5 Kg (20 ounce) copper// //1.25 mm (0.050 inch) thick aluminum//.
   2. When fascia exceeds 150 mm (6 inches) in depth, form one or more horizontal stops not less than 13 mm (1/2 inch) high in the fascia.
   3. Fabricate as two-piece fascia when fascia depth exceeds 250 mm (10 inches).
   4. At joint between ends of sheets, provide a concealed clip soldered or welded near one end of each sheet to hold the adjoining sheet in lapped position. The clip shall be approximately 100 mm (4 inches) wide and shall be the full depth of the fascia less 25 mm (one inch) at top and bottom. Clip shall be of the same thickness as the fascia.
   5. Provide edge strip as specified with lower hooked edge bent outward at an angle of 45 degrees.

C. Formed (Corrugated Sheet) Sheet Metal Gravel Stops and Fascia:
   1. Fabricate as shown of //0.4 mm (0.015 inch) thick stainless steel// //0.5 Kg (16 ounce) copper// //0.8 mm (0.032 inch) thick aluminum//.
   2. Sheets shall have 2 mm (1/16 inch) deep corrugations either transversely or diagonally rolled into the sheet. Crimped sheets are not acceptable.
   3. Factory fabricate prepackaged system, complete with fastenings.

4. Provide concealed flashing splice plate at joints not less than 150 mm (6 inches) long and continuous edge strip at lower edge of fascia made from same metal.
5. Fabricate as two-piece fascia when fascia depth exceeds 175 mm (7 inches).

2.10 BITUMEN STOPS

A. Fabricate bitumen stops for bituminous roofing edges for use with formed sheet metal gravel stops, pipe penetrations, and other penetrations through roof deck without a curb.
B. Fabricate with 19 mm (3/4 inch) vertical legs and 75 mm (3 inch) horizontal legs.
C. When used with gravel stop or metal base flashing use same metal for bitumen stop in thickness specified for concealed locations.

2.11 HANGING GUTTERS

SPEC WRITER NOTE: See Architectural Sheet Metal Manual for minimum thickness of sheet metal and specify. Detail gutter and show size on drawings.

A. Fabricate gutters of not less than the following:
   1. //0.4// //0.5// //0.6//Kg (//16// //20// //24// oz) copper.
   2. //0.5// //0.6// //0.8//mm (//0.018// //0.025// //0.031// inch) thick stainless steel.
   3. //0.6// //0.8// //1.3//mm (//0.025// //0.032// //0.051//inch) thick aluminum.
B. Fabricate hanging gutters in sections not less than 2400 mm (8 feet) long, except at ends of runs where shorter lengths are required.

SPEC WRITER NOTE: When gutter back is against fascia specify higher back edge.

C. Building side of gutter shall be //not less than 38 mm (1 1/2 inches) higher than exterior side// //same height as exterior side//.
D. Gutter Bead: Stiffen outer edge of gutter by folding edge over approximately 19 mm (3/4 inch) toward roof and down approximately19 mm (3/4 inch) unless shown otherwise.
E. Gutter Spacers:
   1. Fabricate of same material and thickness as gutter.
   2. Fabricate 25 mm (one inch) wide strap and fasten to gutters not over 900 mm (36 inches) on center.
   3. Turn back edge up 25 mm (one inch) and lap front edge over gutter bead.
   4. Rivet and solder to gutter except rivet and seal to aluminum.
F. Outlet Tubes:
   1. Form outlet tubes to connect gutters to conductors of same metal and thickness as gutters extend into the conductor 75 mm (3 inch). Flange upper end of outlet tube 13 mm (1/2 inch).
   2. Lock and solder longitudinal seam //except use sealant in lieu of solder with aluminum//.
   3. //Solder tube to gutter. //Seal aluminum tube to gutter and rivet to gutter.
   4. Fabricate basket strainers of same material as gutters.
G. Gutter Brackets:

SPEC WRITER NOTE: Do not use spike and ferrule anchor systems. Use strap hangers or gutter brackets. Design brackets for gutter girth.

1. Fabricate of same metal as gutter. Use the following:
   a. //3 by 25 mm (1/8 by 1 inch)// //6 by 25 mm (1/4 by 1 inch)// copper.
   b. //3 by 25 mm (1/8 by 1 inch)// //3 by 40 mm (1/8 by 1 1/2 inch)// stainless steel.
   c. //5 by 25 mm (3/16 by 1 inch)// //6 by 25 mm (1/4 by 1 inch)// aluminum.
2. Fabricate to gutter profile.
3. Drill two 5 mm (3/16 inch) diameter holes in anchor leg for countersunk flat head screws.

2.12 CONDUCTORS (DOWNSPOUTS)

A. Fabricate conductors of same metal and thickness as gutters in sections approximately 3000 mm (10 feet) long [with 19 mm (3/4 inch) wide flat locked seams].

SPEC WRITER NOTE: Use open faced downspouts in icing areas.

1. Fabricate open face channel shape with hemmed longitudinal edges.

B. Fabricate elbows by mitering, riveting, and soldering except seal aluminum in lieu of solder. Lap upper section to the inside of the lower piece.

C. Fabricate conductor brackets or hangers of same material as conductor, 2 mm (1/16 inch) thick by 25 mm (one inch) minimum width. Form to support conductors 25 mm (one inch) from wall surface in accordance with Architectural Sheet Metal Manual for rectangular and round shapes.

D. Conductor Heads:
   1. Fabricate of same material as conductor.
   2. Fabricate conductor heads to not less than 250 mm (10 inch) wide by 200 mm (8 inch) deep by 200 mm (8 inches) from front to back.
   3. Form front and side edges channel shape not less than 13 mm (1/2 inch) wide flanges with edge hemmed.
   4. Slope bottom to sleeve to conductor or downspout at not less than 60 degree angle.
   5. Extend wall edge not less than 25 mm (one inch) above front edge.
   6. Solder joints for water tight assembly.
   7. Fabricate outlet tube or sleeve at bottom not less than 50 mm (2 inches) long to insert into conductor.

2.13 SPLASHPANS

SPEC WRITER NOTE: Use splash pans where conductors discharge on built-up bituminous roofs.

A. Fabricate splashpans from the following:
   1. 0.4 Kg (16 oz) copper.
   2. 0.4 mm (0.015 inch) thick stainless steel.
   3. 1.25 mm (0.050 inch) thick aluminum.

B. Fabricate in accordance with Architectural Sheet Metal Manual Plate 35 with not less than two ribs as shown in alternate section.

2.14 REGLETS

SPEC WRITER NOTE: Verify reglets are detailed and location clearly shown.

A. Fabricate reglets of one of the following materials:
   1. 0.4 Kg (16 ounce) copper.
   2. Stainless steel, not less than 0.3 mm (0.012 inch) thick.
   3. Plastic coated extruded aluminum, not less than 1.4 mm (0.055 inch) thick prefilled with butyl rubber sealer and complete with plastic wedges inserted at 1000 mm (40 inches) on centers.
   4. Plastic, ASTM D1784, Type II, not less than 2 mm (0.075 inch) thick.
B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.
C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the concrete.
D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.
E. Fabricate mitered corners, fittings, and special shapes as may be required by details.
F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

2.15 INSULATED EXPANSION JOINT COVERS

A. Either type optional, use only one type throughout.
B. Types:
   1. Construct of two preformed, stainless steel strips, not less than 0.4 mm (0.015 inch) thick, mechanically and adhesively bonded to both sides of a 2 mm (1/16 inch) thick neoprene or butyl sheet, or to a 0.4 mm (32 mil) thick reinforced chlorinated polyethylene sheet. Adhesively attach a 10 mm (3/8 inch) thick sheet of closed cell, neoprene foam insulation, to the underside of the neoprene, butyl, or chlorinated polyethylene sheet.
   2. Constructed of a 2 mm (1/16 inch) thick vinyl sheet, flanged at both sides with stainless steel strips not less than 0.4 mm (0.015 inch) thick. Vinyl sheet locked and encased by the stainless steel strip and prepunched for nailing. A 10 mm (3/8 inch) thick closed cell polyvinyl chloride foam insulating strip shall be heat laminated to the underside of the vinyl sheet between the stainless steel strips.
C. Expansion joint covers shall have factory fabricated mitered corners, crossing tees, and other necessary accessories. Furnish in the longest available lengths.
D. Metal flange of sufficient width to extend over the top of the curb and down curb sides 50 mm (2 inches) with hemmed edge for lock to edge strip.

2.16 ENGINE EXHAUST PIPE OR FLUE OR STACK FLASHING

A. Flashing at penetrations through roofing shall consist of a metal collar, sheet metal flashing sleeve and hood.

SPEC WRITER NOTE: Verify flashing and collar systems is detailed on drawings to comply with specification. No exceptions acceptable. Do not allow wood in contact with collar.

B. Fabricate collar with roof flange of 1.2 mm (0.047 inch) minimum thick black iron or galvanized steel sheet.
   1. Fabricate inside diameter of collar 100 mm (4 inches) larger than the outside diameter of the item penetration the roofing.
   2. Extend collar height from structural roof deck to not less than 350 mm (14 inches) above roof surface.
   3. Fabricate collar roof flange not less than 100 mm (4 inches) wide.
   4. Option: Collar may be of steel tubing 3 mm (0.125 inch) minimum wall thickness, with not less than four, 50 mm x 100 mm x 3 mm (2 inch by 4 inch by 0.125 inch) thick tabs bottom edge evenly spaced around tube in lieu of continuous roof flange. Full butt weld joints of collar.

C. Fabricate sleeve base flashing with roof flange of either copper, stainless steel, or copper clad stainless steel.
   1. Fabricate sleeve roof flange not less than 100 mm (4 inches) wide.
   2. Extend sleeve around collar up to top of collar.
   3. Flange bottom of sleeve out not less than 13 mm (1/24 inch) and soldered to 100 mm (4 inch) wide flange to make watertight.
   4. Fabricate interior diameter 50 mm (2 inch) greater than collar.

D. Fabricate hood counter flashing from same material and thickness as sleeve.
   1. Fabricate the same as pipe counter flashing except allow not less than 100 mm (4 inch) lap below top of sleeve and to form vent space minimum of 100 mm (4 inch) wide.
   2. Hem bottom edge of hood 13 mm (1/2 inch).
   3. Provide a 50 mm (2 inch) deep drawband.

E. Fabricate insect screen closure between sleeve and hood. Secure screen to sleeve with sheet metal screws.

2.17 SCUPPERS

SPEC WRITER NOTE: See SMACNA plates 26 thru 29 for scupper, Detail required on drawings.

A. Fabricate scuppers with minimum of 100 mm (4 inch) wide flange.

B. Provide flange at top on through wall scupper to extend to top of base flashing.

C. Fabricate exterior wall side to project not less than 13 mm (1/2 inch) beyond face of wall with drip at bottom outlet edge.

D. Fabricate not less than 100 mm (4 inch) wide flange to lap behind gravel stop fascia.

E. Fabricate exterior wall flange for through wall scupper not less than 25 mm (one inch) wide on top and sides with edges hemmed.

F. Fabricate gravel stop bar of 25 mm x 25 mm (one by one inch) angle strip soldered to bottom of scupper.

G. Fabricate scupper not less than 200 mm (8 inch) wide and not less than 125 mm (5 inch) high for through wall scupper.

H. Solder joints watertight.

2.18 GOOSENECK ROOF VENTILATORS

A. Form of 1.3 mm (0.0508 inch) thick sheet aluminum, reinforce as necessary for rigidity, stiffness, and connection to curb, and to be watertight.

1. Form lower-edge to sleeve to curb.
2. Curb:
    a. Form for 100 mm (4 inch) high sleeve to ventilator.
    b. Form for concealed anchorage to structural curb and to bear on structural curb.
    c. Form bottom edge of curb as counterflashing to lap base flashing.

B. Provide open end with 1.6 mm (16 gage), stainless steel wire guard of 13 mm (1/2 inch) square mesh.

1. Construct suitable aluminum angle frame to retain wire guard.
2. Rivet angle frame to end of gooseneck.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.

7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.
8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
    a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
    b. Paint dissimilar metal with a coat of bituminous paint.
    c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
    a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
    b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

3.2 BASE FLASHING

SPEC WRITER NOTE: Limit use of metal base flashing to small penetrations; less than 3000 mm (10 feet) in length and pipes, where possible.

A. Install where roof membrane type base flashing is not used and where shown.
    1. Install flashing at intersections of roofs with vertical surfaces or at penetrations through roofs, to provide watertight construction.

2. Install metal flashings and accessories having flanges extending out on top of the built-up roofing before final bituminous coat and roof aggregate is applied.
3. Set flanges in heavy trowel coat of roof cement and nail through flanges into wood nailers over bituminous roofing.
4. Secure flange by nailing through roofing into wood blocking with nails spaced 75 mm (3 inch) on centers or, when flange over 100 mm (4 inch) wide terminate in a 13 mm (1/2 inch) folded edge anchored with cleats spaced 200 mm (8 inch) on center. Secure one end of cleat over nail heads. Lock other end into the seam.

B. For long runs of base flashings install in lengths of not less than 2400 mm (8 feet) nor more than 3000 mm (ten feet). Install a 75 mm (3 inch) wide slip type, loose lock expansion joint filled with sealant in joints of base flashing sections over 2400 mm (8 feet) in length. Lock and solder corner joints at corners.

C. Extend base flashing up under counter flashing of roof specialties and accessories or equipment not less than 75 mm (3 inch).

3.3 COUNTERFLASHING (CAP FLASHING OR HOODS)

SPEC WRITER NOTE: At steel pipes a standard screwed iron fitting for clamping counterflashing may be used in lieu of turning metal down into pipe. Check with PLUMBING specification.

A. General:
1. Install counterflashing over and in conjunction with installation of base flashings, except as otherwise specified or shown.
2. Install counterflashing to lap base flashings not less than 100 mm (4 inch).
3. Install upper edge or top of counterflashing not less than 225 mm (9 inch) above top of the roofing.
4. Lap joints not less than 100 mm (4 inch). Stagger joints with relation to metal base flashing joints.
5. Use surface applied counterflashing on existing surfaces and new work where not possible to integrate into item.
6. When fastening to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. Use screws to wood and sheet metal. Set fasteners in mortar joints of masonry work.

B. One Piece Counterflashing:
1. Where flashing is installed at new masonry, coordinate to insure proper height, embed in mortar, and end lap.
2. Where flashing is installed in reglet in concrete insert upper edge into reglet. Hold flashing in place with lead wedges spaced not more than 200 mm (8 inch) apart. Fill joint with sealant.
3. Where flashing is surface mounted on flat surfaces.

a. When top edge is double folded anchor flat portion below sealant "V" joint with fasteners spaced not over 400 mm (16 inch) on center:
   1) Locate fasteners in masonry mortar joints.
   2) Use screws to sheet metal or wood.
b. Fill joint at top with sealant.

4. Where flashing or hood is mounted on pipe.
   a. Secure with draw band tight against pipe.
   b. Set hood and secure to pipe with a one by 25 mm x 3 mm (1 x 1/8 inch) bolt on stainless steel draw band type clamp, or a stainless worm gear type clamp.
   c. Completely fill joint at top with sealant.

C. Two-Piece Counterflashing:
1. Where receiver is installed at new masonry coordinate to insure proper height, embed in mortar, and lap.
2. Surface applied type receiver:
   a. Secure to face construction in accordance, with manufacturers' instructions.
   b. Completely fill space at the top edge of receiver with sealant.
3. Insert counter flashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.

D. Where vented edge occur install so lower edge of counterflashing is against base flashing.
E. When counter flashing is a component of other flashing install as shown.

3.4 REGLETS

A. Install reglets in a manner to provide a watertight installation.
B. Locate reglets not less than 225 mm (9 inch) nor more than 400 mm (16 inch) above roofing, and not less than 125 mm (5 inch) nor more than 325 mm (13 inch) above cant strip.
C. Butt and align end joints or each section of reglet and securely hold in position until concrete or mortar are hardened:
1. Coordinate reglets for anchorage into concrete with formwork construction.
2. Coordinate reglets for masonry to locate horizontally into mortar joints.

3.5 GRAVEL STOPS

SPEC WRITER NOTE: Install gravel stops on raised curb with tapered edge strip not less than 38 mm (1 1/2 inches) above roof line. Verify detail conforms using blocking.

A. General:
1. Install gravel stops and fascias with allowance for expansion at each joint; minimum of 6 mm (1/4 inch).

2. Extend roof flange of gravel stop and splice plates not less than four inches out over roofing and nail or screw to wood nailers. Space fasteners on 75 mm (3 inch) centers in staggered pattern.
3. Install continuous cleat for fascia drip edge. Secure with fasteners as close to lower edge as possible on 75 mm (3 inch) centers.
4. Where ends of gravel stops and fascias abut a vertical wall, provide a watertight, flashed and sealant filled joint.
5. Set flange in roof cement when installed over built-up roofing.
6. Edge securement for low-slope roofs: Low-slope membrane roof systems metal edge securement, except gutters, shall be designed in accordance with ANSI/SPRI/FM ES-1, except the basic wind speed shall be determined from Figure 1609, of IBC 2003.

B. Sheet metal gravel stops and fascia:
1. Install with end joints of splice plates sheets lapped three inches.
2. Hook the lower edge of fascia into a continuous edge strip.
3. Lock top section to bottom section for two-piece fascia.

C. Corrugated sheet gravel stops and fascia:
1. Install 300 mm (12 inch) wide sheet flashing centered under joint. A combination bottom and cover plate, extending above and beneath the joint, may be used.
2. Hook lower edge of fascia into a continuous edge strip.

D. Scuppers:
1. Install scupper with flange behind gravel stops; leave 6 mm (1/4 inch) joint to gravel stop.
2. Set scupper at roof water line and fasten to wood blocking.
3. Use sealant to seal joint with fascia gravel stops at ends.
4. Coordinate to lap over conductor head and to discharge water into conductor head.

3.6 COPINGS

A. General:
1. On walls topped with a wood plank, install a continuous edge strip on the front // and rear // edge of the plank. Lock the coping to the edge strip with a 19 mm (3/4 inch) loose lock seam.
2. Where shown turn down roof side of coping and extend down over base flashing as specified for counter-flashing. Secure counter-flashing to lock strip in coping at continuous cleat.
3. Install ends adjoining existing construction so as to form space for installation of sealants. Sealant is specified in Section 07 92 00, JOINT SEALANTS.

B. Aluminum Coping:
1. Install with 6 mm (1/4 inch) joint between ends of coping sections.
2. Install joint covers, centered at each joint, and securely lock in place.

SPEC WRITER NOTE: If prefinished galvanized steel copings are used change par C title and specify as if aluminum with sealant in lieu of solder.

C. //Stainless steel// //Copper// Copings:

1. Join ends of sheets by a 19 mm (3/4 inch) locked and soldered seam, except at intervals of 9600 mm (32 feet), provide a 38 mm (1 1/2 inch) loose locked expansion joint filled with sealant or mastic.
2. At straight runs between 7200 mm (24 feet) and 19200 mm (64 feet) locate expansion joint at center.
3. At straight runs that exceed 9600 mm (32 feet) and form the leg of a corner locate the expansion joint not more than 4800 mm (16 feet) from the corner.

3.7 EXPANSION JOINT COVERS, INSULATED

A. Install insulated expansion joint covers at locations shown on curbs not less than 200 mm (8 inch) high above roof surface.

B. Install continuous edge strips of same metal as expansion joint flange, nailed at not less than 75 mm (3 inch) centers.

C. Install insulated expansion joint covers in accordance with manufacturer's directions locking edges to edge strips.

3.8 ENGINE EXHAUST PIPE OR STACK FLASHING

A. Set collar where shown and secure roof tabs or flange of collar to structural deck with 13 mm (1/2 inch) diameter bolts.

B. Set flange of sleeve base flashing not less than 100 mm (4 inch) beyond collar on all sides as specified for base flashing.

C. Install hood to above the top of the sleeve 50 mm (2 inch) and to extend from sleeve same distance as space between collar and sleeve beyond edge not sleeve:

1. Install insect screen to fit between bottom edge of hood and side of sleeve.
2. Set collar of hood in high temperature sealant and secure with one by 3 mm (1/8 inch) bolt on stainless steel draw band type, or stainless steel worm gear type clamp. Install sealant at top of head.

3.9 HANGING GUTTERS

A. Hang gutters with high points equidistant from downspouts. Slope at not less than 1:200 (1/16 inch per foot).

B. Lap joints, except for expansion joints, at least 25 mm (one inch) in the direction of flow. Rivet and seal or solder lapped joints.

C. Support gutters in brackets spaced not more than 600 mm (24 inch) on centers, brackets attached to facial or wood nailer by at least two screws or nails.

1. For copper or copper clad stainless steel gutters use brass or bronze brackets.
2. For stainless steel gutters use stainless steel brackets.
3. For aluminum gutters use aluminum brackets or stainless steel brackets.

4. Use brass or stainless steel screws.

D. Secure brackets to gutters in such a manner as to allow free movement of gutter due to expansion and contraction.

SPEC WRITER NOTE: Insure roof plan shows location of gutters, outlets or conductors, and expansion joints.

E. Gutter Expansion Joint:
   1. Locate expansion joints midway between outlet tubes.
   2. Provide at least a 25 mm (one inch) expansion joint space between end baffles of gutters.
   3. Install a cover plate over the space at expansion joint.
   4. Fasten cover plates to gutter section on one side of expansion joint only.
   5. Secure loose end of cover plate to gutter section on other side of expansion joint by a loose-locked slip joint.

F. Outlet Tubes: Set bracket strainers loosely into gutter outlet tubes.

3.10 CONDUCTORS (DOWNSPOUTS)

A. Where scuppers discharge into downspouts install conductor head to receive discharge with back edge up behind drip edge of scupper. Fasten and seal joint. Sleeve conductors to gutter outlet tubes and fasten joint and joints between sections.

B. Set conductors plumb and clear of wall, and anchor to wall with two anchor straps, located near top and bottom of each section of conductor. Strap at top shall be fixed to downspout, intermediate straps and strap at bottom shall be slotted to allow not less than 13 mm (1/2 inch) movement for each 3000 mm (10 feet) of downspout.

C. Install elbows, offsets and shoes where shown and required. Slope not less than 45 degrees.

3.11 SPLASH PANS

A. Install where downspouts discharge on low slope roofs unless shown otherwise.

B. Set in roof cement prior to pour coat installation or sealant compatible with single ply roofing membrane.

3.12 GOOSENECK ROOF VENTILATORS

A. Install on structural curb not less than 200 mm (8 inch) high above roof surface.

B. Securely anchor ventilator curb to structural curb with fasteners spaced not over 300 mm (12 inch) on center.

C. Anchor gooseneck to curb with screws having neoprene washers at 150 mm (6 inch) on center.

END OF SECTION

SECTION 07 72 00
ROOF VENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Roof vents of the following types:
1. Continuous ridge vents. (Duraflo PRORidge Vent).
2. Turbine vents. (Duraflo PROTurbo Vent).
3. Static vents. (Duraflo PRO75 Roof Vent) (Duraflo PRO50 Roof Vent) (Duraflo PROSlantBack Roof Vent) (Duraflo 3 TIER PROVentilator Roof Vent) (Duraflo 2 TIER PROVentilator Roof Vent) (Duraflo 1 TIER PROVentilator Roof Vent).
4. Exhaust vents (Duraflo Gooseneck Bathroom Exhaust Vent) (Duraflo Gooseneck Roof Dryer Exhaust Vent)

1.2 RELATED SECTIONS

A. Section 07 31 13 - Asphalt Shingles.

B. Section 07 72 13 - Manufactured Curbs.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum five (5) years of experience manufacturing similar products.

B. Installer Qualifications: Minimum two (2) years of experience installing similar products.

1.5 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting Work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 WARRANTY

A. Warranty: Provide manufacturer's standard limited warranty, and as follows:
   1. Duraflo.
   2. Duraflo PRORidge: 35 year limited warranty.
   3. Duraflo PROTurbo Vent: 35 year limited warranty.
   4. Duraflo PRO75 Roof Vent: 35 year limited warranty.
   5. Duraflo PRO50 Roof Vent: 35 year limited warranty.
   6. Duraflo PROSlantBack Roof Vent: 35 year limited warranty.
   7. Duraflo PROVentilator Roof Vent: 35 year limited warranty.
   8. Duraflo PROGooseneck Bathroom Exhaust Vent: 35 year limited warranty
   9. Duraflo PROGooseneck Roof Dryer Exhaust Vent: 35 year limited warranty

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: DURAFLO, which is located at: 500 Veterans Dr. P.O.Box 1800; Barrie, ON, Canada L4M 4V3; Toll Free Tel: 800-461-1771; Tel: 705-726-3361; Fax: 705-726-2186; Email:request info (dburtch@canplas.com); Web:http://canplas.com/duraflo

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 ROOF VENTS

A. Roof ventilation shall be from a single source of Duraflo Roofing Ventilation products manufactured by Canplas Industries Ltd.

B. The vents shall be manufactured from all virgin polypropylene using injection molding technology.

C. The material shall be cold impact tested to -40 degrees F (-38 degrees C) and shall remain functional, flexible and resilient to damage even when installed with a nail gun.

D. The material shall contain UV inhibitors and pass UV accelerated testing per ASTM G-155 for 15 year accelerated testing.

2.3 CONTINUOUS RIDGE VENTS

A. Product: Duraflo PRORidge Vent as manufactured by Canplas Industries Ltd.
   1. Design: Internal baffles and drainage openings easily deflect and direct away extreme weather. Airfoil designed edge allows smooth airflow over the ridge line maximizing effective ventilation from the attic space. TriFold flexibility for use on full range of pitches. Code regulated insect grill. Net Free Area: 18.3 sq.in./lin.ft.(387 sq.cm/lin. m).
   2. Category 2 hurricane rated.
   3. CSA certified - Plastic Type C ridge vent, for installation on roof ridge.
   4. Construction: Injection molded from pure, high grade polypropylene with premium UV inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
   5. Model: Metric - Black (6072METBL). 12.88 inches x 48 inches (327 mm x 1219 mm).

6. Model: Metric - Brown (6072METBR). 12.88 inches x 48 inches (327 mm x 1219 mm).
7. Model: Metric - Weatherwood (6072METWW). 12.88 inches x 48 inches (327 mm x 1219 mm).
8. Model: Imperial - Black (6073BL). 11.66 inches x 48 inches (296 mm x 1219 mm).
9. Model: Imperial - Brown (6073BR). 11.66 inches x 48 inches (296 mm x 1219 mm).
10. Model: Imperial - Weatherwood (6073WW). 11.66 inches x 48 inches (296 mm x 1219 mm).

2.4 TURBINE VENTS

A. Product: Duraflo PROTurbo Vent as manufactured by Canplas Industries Ltd.
1. Design: No internal or external moving parts - requires no maintenance. Internal baffles deflect water and snow, allowing it to drain out the drainage openings. Allows high airflow while providing excellent defense against weather infiltration. Two-piece base fits roof pitches from 3/12 to 12/12. 117 sq. in. (755 sq. cm) net free area.
2. Construction: Injection molded from pure, high grade polypropylene with premium UV inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
3. CSA certified - Plastic Type B roof vents, for installation on sloping surfaces.
4. Category 2 hurricane rated.
5. Construction: Injection molded from pure, high grade polypropylene with premium UV inhibitor additives.
6. Model: Black (60PRO117BL) 18.18 inches x 18.18 inches x 16.60 inches (461.77mm x 461.77mm x 421.64mm).
7. Model: Brown (60PRO117BR) 18.18 inches x 18.18 inches x 16.60 inches (461.77mm x 461.77mm x 421.64mm).
8. Model: Weatherwood (60PRO117WW) 18.18 inches x 18.18 inches x 16.60 inches (461.77mm x 461.77mm x 421.64mm).
9. Model: Grey (60PRO117G) 18.18 inches x 18.18 inches x 16.60 inches (461.77mm x 461.77mm x 421.64mm).

2.5 STATIC VENTS

A. Product: Duraflo PRO75 Roof Vent as manufactured by Canplas Industries Ltd.
1. Design: Top venting design uses chimney effect to channel moist air away from roof eliminating shingle staining. Vent cap design with built in weeping holes eliminates bird nesting and water pooling. Roof pitch range 3/12 to 12/12. Net free venting area of 75 sq. inches (483 sq. cm).
2. Construction: Injection molded from pure, high grade polypropylene with premium UV inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
3. CSA certified - Plastic Type B roof vents, for installation on sloping surfaces.
4. Model: Black (60PRO75BL) 21.81 inches x 21.81 inches x 5.5 inches (553.97 mm x 553.97 mm x 140 mm).
5. Model: Brown (60PRO75BR) 21.81 inches x 21.81 inches x 5.5 inches (553.97 mm x 553.97 mmx 140 mm).
6. Model: Gray (60PRO75G) 21.81 inches x 21.81 inches x 5.5 inches (553.97 mm x 553.97mmx 140 mm).
7. Model: Weatherwood (60PRO75WW) 21.81 inches x 21.81 inches x 5.5 inches (553.97 mm x 553.97 mm x 140 mm).

B. Product: Duraflo PRO50 Roof Vent as manufactured by Canplas Industries Ltd.
1. Design: Top venting design uses chimney effect to channel moist air away from roof eliminating shingle staining. Vent cap design with built in weeping holes eliminates bird nesting and water pooling. Roof pitch range 3/12 to 14/12. Net free venting area of 50 sq. inches (322 sq. cm).
2. Construction: Injection molded from pure, high grade polypropylene with premium UV

inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
3. CSA certified - Plastic Type B roof vents, for installation on sloping surfaces.
4. Category 2 hurricane rated.
5. Model: Black (60PRO50BL) 18.38 inches x 18.38 inches x 4.63 inches (466.85 mm x 466.85 mm x 117.60 mm).
6. Model: Brown (60PRO50BR) 18.38 inches x 18.38 inches x 4.63 inches (466.85 mm x 466.85 mm x 117.60 mm).
7. Model: Grey (60PRO50G) 18.38 inches x 18.38 inches x 4.63 inches (466.85 mm x 466.85 mm x 117.60 mm).
8. Model: Weatherwood (60PRO50WW) 18.38 inches x 18.38 inches x 4.63 inches (466.85 mm x 466.85 mm x 117.60 mm).

C. Product: Duraflo PROSlantBack Roof Vent as manufactured by Canplas Industries Ltd.
1. Design: Top venting design uses chimney effect to channel moist air away from roof eliminating shingle staining. Vent cap design with built in weeping holes eliminates bird nesting and water pooling. Roof pitch range 3/12 to 14/12. Net free venting area of 50 sq. inches (322 sq. cm).
2. Construction: Injection molded from pure, high grade polypropylene with premium UV inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
3. CSA certified - Plastic Type B roof vents, for installation on sloping surfaces.
4. Category 2 hurricane rated.
5. Model: Black (60PRO50SLBL) 17.97 inches x 24.13 inches x 3.36 inches (456.44 mm x 612.90 mm x 85.34 mm).
6. Model: Brown (60PRO50SLBR) 17.97 inches x 24.13 inches x 3.36 inches (456.44 mm x 612.90 mm x 85.34 mm).
7. Model: Grey (60PRO50SLG) 17.97 inches x 24.13 inches x 3.36 inches (456.44 mm x 612.90 mm x 85.34 mm).
8. Model: Weatherwood (60PRO50SLWW) 17.97 inches x 24.13 inches x 3.36 inches (456.44 mm x 612.90 mm x 85.34 mm).

D. Product: Duraflo 3 TIER PROVentilator Roof Vent as manufactured by Canplas Industries Ltd.
1. Design: Chimney style design allows ventilator to harness wind energy and create pressure variances that draw air out from within the attic space. Roof pitch range 3/12 to 12/12. Net free venting area of 130 sq. inches (838 sq. cm).
2. Construction: Injection molded from pure, high grade polypropylene with premium UV inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
3. Category 2 hurricane rated.
4. Model: Black (60PRO150BL) 21.25 inches x 21.25 inches x 22 inches (539.75 mm x 539.75 mm x 559 mm).
5. Model: Brown (60PRO150BR) 21.25 inches x 21.25 inches x 22 inches (539.75 mm x 539.75 mm x 559 mm).
6. Model: Gray (60PRO150G) 21.25 inches x 21.25 inches x 22 inches (539.75 mm x 539.75mm x 559 mm).
7. Model: Weatherwood (60PRO150WW) 21.25 inches x 21.25 inches x 22 inches (539.75 mm x 539.75 mm x 559 mm).

E. Product: Duraflo 2 TIER PROVentilator Roof Vent as manufactured by Canplas Industries Ltd.
1. Design: Chimney style design allows ventilator to harness wind energy and create pressure variances that draw air out from within the attic space. Roof pitch range 3/12 to 12/12. Net free venting area of 95 sq. inches (613 sq. cm).
2. Construction: Injection molded from pure, high grade polypropylene with premium UV

inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
3. Category 2 hurricane rated.
4. Model: Black (60PRO140BL) 21.25 inches x 21.25 inches x 19.50 inches (539.75 mm x 539.75 mm x 495 mm).
5. Model: Brown (60PRO140BR) 21.25 inches x 21.25 inches x 19.50 inches (539.75 mm x 539.75 mm x 495 mm).
6. Model: Gray (60PRO140G) 21.25 inches x 21.25 inches x 19.5 inches (539.75 mm x 539.75mm x 495 mm).
7. Model: Weatherwood (60PRO140WW) 21.25 inches x 21.25 inches x 19.5 inches (539.75 mm x 539.75 mm x 495 mm).

F. Product: Duraflo 1 TIER PROVentilator Roof Vent as manufactured by Canplas Industries Ltd.
1. Design: Chimney style design allows ventilator to harness wind energy and create pressure variances that draw air out from within the attic space. Roof pitch range 3/12 to 12/12. Net free venting area of 48 sq. inches (310 sq. cm).
2. Construction: Injection molded from pure, high grade polypropylene with premium UV inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
3. Category 2 hurricane rated.
4. Model: Black (60PRO130BL) 21.25 inches x 21.25 inches x 17 inches (539.75 mm x 539.75 mm x 431.8 mm).
5. Model: Brown (60PRO130BR) 21.25 inches x 21.25 inches x 17 inches (539.75 mm x 539.75 mm x 431.8 mm).
6. Model: Gray (60PRO130G) 21.25 inches x 21.25 inches x 17 inches (539.75 mm x 539.75mm x 431.8 mm).
7. Model: Weatherwood (60PRO130WW) 21.25 inches x 21.25 inches x 17 inches (539.75 mm x 539.75 mm x 431.8 mm).

2.6 EXHAUST VENTS

A. Product: Duraflo Gooseneck Bathroom Exhaust Vent as manufactured by Canplas Industries Ltd.
1. Design: Installed on a sloped, shingled roof to exhaust bathroom fans by the means of a roof penetration. Includes an internal damper to reduce backdraft and an exterior grill to prevent the infiltration and nesting of birds, vermin and insects.
2. Construction: Injection molded from pure, high grade polypropylene with premium UV inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
3. CSA certified.
4. Model: Black (60PRO30BL) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm) Gooseneck bathroom exhaust vent with collar, black.
5. Model: Brown (60PRO30BR) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm) Gooseneck bathroom exhaust vent with collar, brown.
6. Model: Grey (60PRO30G) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm) Gooseneck bathroom exhaust vent with collar, grey
7. Model: Weatherwood (60PRO30WW) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm) Gooseneck bathroom exhaust vent with collar, weatherwood.
8. Model: Black (60PRO31BL) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm) Gooseneck bathroom exhaust vent without collar, black.
9. Model: Brown (60PRO31BR) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm) Gooseneck bathroom exhaust vent without collar, brown.
10. Model: Grey (60PRO31G) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm) Gooseneck bathroom exhaust vent without collar grey.
11. Model: Weatherwood (60PRO31WW) 15 inches x 18.63 inches x 9.5 inches (381 mm

x 473 mm x 241 mm) Gooseneck bathroom exhaust vent without collar, weatherwood.

B. Product: Duraflo Gooseneck Roof Dryer Exhaust Vent as manufactured by Canplas Industries Ltd.
   1. Design: Installed on a sloped, shingled roof to exhaust clothes dryers by the means of a roof penetration. Includes an internal damper to reduce backdraft and an exterior grill to prevent the infiltration and nesting of birds and vermin, while allowing for lint to escape.
   2. Construction: Injection molded from pure, high grade polypropylene with premium UV inhibitor additives. Engineered to resist denting, peeling, extreme heat and cold impact to -40 degree F (-38 degree C).
   3. Model: Black (6032BL) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm) Gooseneck roof dryer exhaust vent with collar, black.
   4. Model: Brown (6032BR) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm): Gooseneck roof dryer exhaust vent with collar, brown.
   5. Model: Grey (6032G) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm): Gooseneck roof dryer exhaust vent with collar, grey.
   6. Model: Weatherwood (6032WW) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm): Gooseneck roof dryer exhaust vent with collar, weatherwood.
   7. Model: Black (6033BL) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm): Gooseneck roof dryer exhaust vent, without collar, black.
   8. Model: Brown (6033BR) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm): Gooseneck roof dryer exhaust vent, without collar, brown.
   9. Model: Grey (6033G) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm): Gooseneck roof dryer exhaust vent, without collar, grey.
   10. Model: Weatherwood (6033WW) 15 inches x 18.63 inches x 9.5 inches (381 mm x 473 mm x 241 mm): Gooseneck roof dryer exhaust vent, without collar, weatherwood.

C. Adaptor Collar:
   1. Model 6030-4BC: Connection to a 4 inches (102 mm), 5 inches (127 mm) or 6 inches (152 mm) duct or pipe for the Gooseneck exhaust vents. Provides a leak free body.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been 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 surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction.

3.4 FIELD QUALITY CONTROL

A. Provide inspection certificates of Authority Having Jurisdiction (AHJ).

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 92 00
ACOUSTICAL JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Acoustical joint sealant.

B. Acoustical putty.

1.2 RELATED SECTIONS

A. Section 13 48 13 - Manufactured Sound and Vibration Control Components.

1.3 REFERENCES

A. ASTM International (ASTM):
1. ASTM C834 Standard Specification for Latex Sealants.
2. ASTM C1183 Standard Test Method for Extrusion Rate of Elastomeric Sealants.
3. ASTM C732 Standard Test Method for Aging Effects of Artificial Weathering on Latex Sealants.
4. ASTM C1241 Standard Test Method for Volume Shrinkage of Latex Sealants During Cure.
5. ASTM C734 Standard Test Method for Low-Temperature Flexibility of Latex Sealants After Artificial Weathering.
6. ASTM C736 Standard Test Method for Extension-Recovery and Adhesion of Latex Sealants.
7. ASTM D2202 Standard Test Method for Slump of Sealants.
8. ASTM D2203 Standard Test Method for Staining from Sealants.
9. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM International (ASTM):
1. ASTM D412 Standard Test Method for Standard Test Methods for Vulcanized Rubber and Thermoplastic ElastomersTension
2. ASTM C627 Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Submit manufacturer current technical literature for each component.

C. Quality Assurance/Control Submittals:
1. Test Reports: Upon request, provide test reports from recognized testing laboratories.
2. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.

D. Closeout Submittals: Submit the following:
1. Warranty documents specified herein.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship is approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.6 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements Section.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
   1. Store all products in a dry location until use.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.10 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

C. Warranty Period: _____ years beginning with Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Acoustical Sealant:
   1. Standard Specification for Latex Sealants (ASTM C834): Grade -18 degrees C.
      a. Extrudability (ASTM C1183 Method B): >=2.1 g/s Extrusion Rate.
      b. Artificial Weathering (ASTM C732 500 Hours): No wash-out, slump, or cracking. Also <=25% total bond area loss.
      c. Volume Shrinkage (ASTM C1241 Type OP): <=30% volume shrinkage.
      d. Low Temperature Flexibility (ASTM C734): Grade -18 degrees C, no adhesion loss or cracking through to substrate after 500 hours.
      e. Recovery and Adhesion Loss (ASTM C736): >=75% recovery and <=25% total bond area loss.
      f. Slump (ASTM D2202): No slump observed.
      g. Stain Index (ASTM D2203): Maximum allowable stain index of 1.
   2. Surface Burning Characteristics (ASTM E84): Meets NFPA Class A Fire-Rating.

B. Acoustical Putty:
   1. Type: Noise damping putty.
   2. Size: 7 inches x 7 inches (178 mm x 178 mm) pad.
   3. Thickness: 1/8 inch (3.17 mm).
   4. Weight: 6 oz pad.
   5. Color: Blue-green.
   6. Density: 1oz/cu. in.
   7. Unit Size: 10 pads/box.
   8. Tensile Strength (ASTM D412): 135 PSI.
   9. Compression set B: 13% max.
   10. TCA Robinson test (ASTM C627): Light Commercial.
   11. Surface Burning characteristics (ASTM E84): Meets Flame Spread Index Class B..

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 SEALANT INSTALLATION

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

B. Follow all OSHA guidelines when completing any construction project.

C. Clean surfaces so they are free from dirt, grease, wax, dust, corrosion, moisture or any material that may interfere with obtaining optimum adhesion.

D. Apply a full 1/8 to 1/4 inch (3 mm to 6 mm) bead to seal openings where wall meets the ceiling, floor and adjoining walls, to the perimeter of all cut-outs including those for outlet boxes, pipes, conduit, and vents.

E. Make sure the joint is completely filled. It is recommended to push sealant into the joint with a finger. For ease of clean up, wear disposable gloves during installation.

F. Clean up excess with putty knife and/or soap and water.

3.4 UNDERLAYMENT INSTALLATION

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

B. Installation:
1. Remove the release paper.
2. Inspect the fire rated outlet box to make sure it is properly installed and free of free of dust, grease, oil, loose materials, rust or other substances.
3. Starting at side, align the putty pad to front edge of box and overlap onto the stud.
4. Cut the putty pad to allow the pad to fit around conduits or cables.
5. Pleat the extra material at the corners.
6. Fold the pleated corners into place and firmly press the putty pad into place so that the entire surface of the back of the outlet box is covered.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch up, repair or replace damaged products prior to Substantial Completion.

END OF SECTION

DIVISION 8 – OPENINGS

SECTION 08 11 00
STEEL DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel entrance doors including transoms and sidelites.

B. Prehung hardwood door systems.

C. Glazing.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 09 21 16.33 - Gypsum Board Area Separation Wall Assemblies.

1.3 REFERENCES

A. American Architectural Manufacturer Association (AAMA):
1. AAMA 1304 - Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
2. AAMA 506; Voluntary Specifications for Hurricane and Impact and Cycle Testing of Fenestration Products.

B. ASTM International (ASTM):
1. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Doors Under Specified Pressure Differences Across the Specimen.
2. ASTM E330 - Standard Test Method for Structural Performance of Exterior Doors by Uniform Static Pressure Difference.
3. ASTM E331 - Standard Test Method for Water Penetration of Exterior Doors by Uniform Static Air Pressure Difference.
4. ASTM E547; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
5. ASTM E1886 - Standard Test Method for Performance of Exterior Doors by Missile(s) and Exposed to Cyclic Pressure Differentials.
6. ASTM E1996 - Standard Specification for Performance of Exterior Doors by Windborne Debris in Hurricanes.

C. Florida Building Code (FBC):
1. FBC 1626 - High-Velocity Hurricane Zones - Wind Loads.
2. TAS 201-94 - Impact Test Procedures.
3. TAS 202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components Using Uniform Static Air Pressure.
4. TAS 203-94 - Criteria for Testing Products Subject to Cycle Wind Pressure Loading.

D. National Fenestration Rating Council (NFRC):
1. NFRC 100 - Procedure for Determining Fenestration Thermal Properties.
2. NFRC 200 - Solar Heat Gain Coefficient and Visible Transmittance.

E. National Fire Protection Association (NFPA):
1. NFPA 252 - Standard Methods of Fire Tests of Doors Assemblies.

F. Underwriters Laboratories, Inc. (UL)
   1. UL 10B - Standard for Fire Test of Door Assemblies.
   2. UL 10C - Standard for positive Pressure Fire Tests of Doors Assemblies.

G. Uniform Building Code Standard 7-2 (UBC):
   1. UBC 7-2 - Fire Tests of Door Assemblies. (Note: Neutral pressure testing standard).
   2. UBC 7-2 - Fire Test of Door Assemblies. (Note: Positive pressure testing standard).

H. Underwriters' Laboratories of Canada (ULC):
   1. CAN/ULC S104 - Standard Method for Fire Tests of Door Assemblies.

I. Window & Door Manufacturers Association (WDMA):
   1. WDMA I.S.4 - Water Repellent Preservative Non-Pressure Treatment for Millwork.
   2. Sponsored Hallmark Certification Program.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Submit shop drawings indicating details of construction, flashings and relationship with adjacent construction.

D. Verification Samples: For each factory-finished product specified, two samples, minimum size 6 in (150 mm) square, representing actual finishes.

E. Quality Assurance Submittals:
   1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
   2. Manufacturer Instructions: Provide manufacturer's written installation instructions.

F. Closeout Submittals: Refer to Section 01 70 00 - Execution and Closeout Requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Minimum 2 years installing similar assemblies.

B. Certifications: NAMI certification label indicating assemblies meet the design requirements.

C. Mock-Up: Provide a mock-up for evaluation of installation techniques and workmanship.
   1. Mock-ups shall incorporate surrounding construction, including wall assembly fasteners, flashing, and other related accessories installed in accordance with manufacturer's approved installation methods.
   2. Do not proceed with remaining work until workmanship is approved by Architect.
   3. Rework mock-up as required to produce acceptable work.
   4. At Substantial Completion, approved mockups may become part of completed Work.
   5. Demolish mockups and remove from site.

D. Pre-installation Meeting: Conduct pre-installation meeting on site two weeks prior to commencement of installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's

instructions and recommendations and industry standards.

B. Deliver and store assembly materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.
   1. Protect from damage and exposure to direct sunlight during storage.
   2. Store in a dry, well-ventilated area off the floor.
   3. During storage, do not remove paper or cardboard placed between products for shipment.
   4. Store in a humidity and temperature controlled facility. Recommended conditions: 30 to 50 percent relative humidity and 50 to 90 degrees F (10 to 32 degrees C).

C. Handling: Handle with clean hands and equipment. Lift and carry the products when moving them. Do not drag across one another.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions; temperature, humidity, and ventilation, within limits recommended by manufacturer for optimum results. Install only in vertical walls and when conditions are dry. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
   1. Door Slab: 10 Years.
   2. Door System: 10 Years.
   3. Auralast Frame: Lifetime.
   4. Steel Frame: See manufacturers separate warranty.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturer: JELD-WEN, Inc., which is located at: 2645 Silver Crescent Dr. Suite 400; Charlotte, NC 28273 ; Toll Free Tel: 800-535-3936; Tel: 541-850-2606; Fax: 541-851-4333; Email:request info (Architectural_Inquiries@jeld-wen.com); Web:www.jeld-wen.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 STEEL ENTRANCE DOORS

A. Basis of Design: Contours Steel Doors as manufactured by JELD-WEN Incorporated.
   1. Panel Doors:
      a. CC-30.
      b. CT-100.
      c. CT7-100.
      d. CT8-100.
      e. CT-11.
      f. CT-30.
      g. CT-40.
      h. CT-60.
      i. CT7-60.
      j. CT8-60

k. CT-80.
l. CT-90.
m. CT-21.
n. CT-20.
o. CT-24.
p. 1-Panel Flat.
q. 1-Panel Diamond Plate.
r. 2-Panel Square Top Flat.
s. Craftsman 3-Panel Flat.

2. Paneled and Glass doors:
   a. CC-866.
   b. CT-686.
   c. CT7-686.
   d. CT8-686.
   e. CT-919.
   f. CT7-919.
   g. CT8-919.
   h. CT-607.
   i. CT-684.
   j. CT7-684.
   k. CT8-684.
   l. CT-684-1P.
   m. CT-684-1PL.
   n. CT-673.
   o. CT-673-1P.
   p. CT-673-1PL.
   q. CT-637.
   r. CT-692.
   s. CT7-692.
   t. CT8-692.
   u. CT-422.
   v. CT-949.
   w. CT-648.
   x. CT-659.
   y. CT-640.
   z. CT-696.
   aa. CT7-696.
   bb. CT-412.
   cc. CT7-412.
   dd. CT-680.
   ee. CT7-680.
   ff. Craftsman 3-Panel.
3. Paneled and Glass with Fixed External Grille Doors:
   a. CC-866FG6.
   b. CT-686FG15.
   c. CT7-686FG15.
   d. CT8-686FG18.
   e. CT-686FG10.
   f. CT7-686FG10.
   g. CT8-686FG12.
   h. CT-686FG8.
   i. CT7-686FG8.
   j. CT-636FG17.
   k. CT7-63617.
   l. CT-607FG12.
   m. CT-607FG6.

n. CT8-684FG6.
o. CT-607FG4.
p. CT-684FG9.
q. CT7-684FG9.
r. CT8-684FG12.
s. CT-684FG9-1P.
t. CT-684FG9-1PL.
u. CT-684FG4.
v. CT7-684FG4.
w. CT8-684FG4.
x. CT-684DFG.
y. CT-684DFG.
z. CT7-684DFG.
aa. CT-684DFG-1P.
bb. CT-637FG11.
cc. CT-692FG3.
dd. CT7-692FG3.
ee. CT8-692FG4.
ff. CT-626FG7.
gg. CT-648FG11.
hh. CT-659FG5.
ii. CT-224FG4.
jj. CT-662FG4.
kk. CT7-662FG4.
ll. CT-686PFG.
mm. CT7-686PFG.

4. Paneled and Glass with Internal Contour Grille Doors:
   a. CT-686CM15.
   b. CT7-686CM15.
   c. CT8-686CM18.
   d. CT-686CM10.
   e. CT7-686CM10.
   f. CT8-686CM12.
   g. CT-607CM12.
   h. CT-684CM9.
   i. CT7-684CM9.
   j. CT-684CM12.
   k. CT-684CM9-1P.
   l. CT-684CM9-1PL.
   m. CT-692CM3.
   n. CT7-692CM3.
   o. CT8-692CM4.
5. Paneled and Glass with Internal Muntin Grille Doors:
   a. CT-686IM15.
   b. CT7-686IM15.
   c. CT8-686IM18.
   d. CT-686IM10.
   e. CT7-686IM10.
   f. CT8-686IM12.
   g. CT-607IM12.
   h. CM-684IM9.
   i. CM7-684IM9.
   j. CT8-684IM12.
   k. CT-684IM9-1P.
   l. CT-684IM9-1PL.
   m. CT-692IM3.

n. CT7-692IM3.
o. CT8-692IM4.
p. CT-662IM4.
q. CT7-662IM4.

6. Paneled and Glass with Internal Wide Muntin Grille Doors:
   a. CT-686WM15.
   b. CT7-686WM15.
   c. CT8-686WM18.
   d. CT-686WM10.
   e. CT7-686WM10.
   f. CT8-686WM12.
   g. CT-686WM8.
   h. CT7-686WM8.
   i. CT-607WM12.
   j. CT-607WM6.
   k. CT8-684WM6.
   l. CT-607WM4.
   m. CT-684WM9.
   n. CT7-684WM9.
   o. CT8-684WM12.
   p. CT-684WM9-1P.
   q. CT-684WM9-1PL.
   r. CT-684WM4.
   s. CT7-684WM4.
   t. CT8-684WM4.
   u. CT-684WM4-1P.
   v. CT-684WM4-1PL.
   w. CT-692WM3.
   x. CT7-692WM3.
   y. CT8-692WM4.
7. Paneled and Glass with Simulated Divide Lite Doors:
   a. CC-866SD3.
   b. CC-866SD6.
8. Paneled and Glass with Internal Prairie Muntin Grille Doors:
   a. CT-686PM.
   b. CT7-686PM.
   c. CT8-686PM.
   d. CT-607PM.
   e. CT-684PM.
   f. CT7-684PM.
   g. CT8-684PM.
   h. CT-684PM-1P.
   i. CT-684PM-1PL.
   j. CT-692PM.
   k. CT7-692PM.
   l. CT8-692PM.
9. Paneled and Glass with Internal Wide Prairie Muntin Grille Doors:
   a. CT-686WPM.
   b. CT7-686WPM.
   c. CT-607WPM.
   d. CT-684WPM.
   e. CT7-684WPM.
   f. CT8-684WPM.
   g. CT-684WPM-1P.
   h. CT-684WPM-1PL.
   i. CT-692WPM.

j. CT7-692WPM.
k. CT8-692WPM.

10. Paneled and Glass with Internal Top Down Grille Doors:
    a. CT-686AC4.
    b. CT7-686AC4.
    c. CT8-686AC4.
    d. CT-686AC3.
    e. CT7-686AC3.
    f. CT8-686AC3.
    g. CT-607AC4.
    h. CT-607AC3.
    i. CT-684AC4.
    j. CT7-684AC4.
    k. CT8-684AC4.
    l. CT-684AC3.
    m. CT7-684AC3.
    n. CT8-684AC3.
    o. CT-684AC4-1P.
    p. CT-684AC3-1P.
    q. CT-684AC4-1PL.
    r. CT-684AC3-1PL.
11. Blinds Between the Glass (BL) Doors - Triple Glazed Doorglass Blinds:
    a. CT-686BL.
    b. CT-684BL.
    c. CT-684BL-1P.
    d. CT-684BL-1PL.
12. Blinds Between the Glass (BL) Doors & Grilles Between Glass:
    a. CT-686BL15.
    b. CT7-686BL15.
    c. CT-686BL10.
    d. CT7-686BL10.
    e. CT-684BL9.
    f. CT7-684BL9.
    g. CT-684BL9-1P.
    h. CT-684BL9-1PL.
13. Blinds Between the Glass (RLB) Doors - Raise, Lower and Tilt Doorglass Blinds:
    a. CT-686RLB.
    b. CT7-686RLB.
    c. CT8-686RLB.
    d. CT-607RLB.
    e. CT-684RLB.
    f. CT7-684RLB.
    g. CT8-684RLB.
    h. CT-684RLB-1P.
    i. CT-684RLB-1PL.
    j. CT-692RLB.
    k. CT7-692RLB.
14. Paneled and Vent Doors:
    a. CT-799.
    b. CT7-799.
15. Paneled and Vent Doors with Internal Muntin Grille Doors:
    a. CT-799IM.
    b. CT7-799IM.
16. Options
    a. Fixed Grilles: Standard style, 5/8 in (16 mm) bar with white finish.
    b. Simulated Divided Lites: Craftsman style, 7/8 in (22 mm) bar with white finish.

c. Grilles Between the Glass:
    1) Contoured style internal muntin, 11/16 in (17 mm) bar:
        a) Finish: White.
        b) Finish: Champagne.
    2) Flat style, internal muntin, 5/8 in (16 mm) bar:
        a) Finish: White.
        b) Finish: Champagne.
        c) Finish: Bronze.
    3) Flat style, wide internal muntin, 7/8 in (22 mm) bar:
        a) Finish: White.
        b) Finish: Tan.
    4) Prairie style, 5/8 in (16 mm) bar:
        a) Finish: White.
        b) Finish: Champagne.
    5) Prairie wide style, 7/8 in (22 mm) bar:
        a) Finish: White.
        b) Finish: Tan.
    6) Top Down style, 5/8 in (16 mm) bar with white finish.
d. Blinds Between the Glass: Raise, lower and tilt blinds, with all-in-one control.
e. Triple Glazed Doorglass Blinds:
    1) Raise, lower and tilt blind.
    2) Raise, lower and tilt blinds with contoured style, 11/16 in (17 mm) internal bar with white finish.
f. Craftsman Shelf: Optional Shelf.

B. Basis of Design: Gladiator Steel Doors as manufactured by JELD-WEN Incorporated.
1. Panel Doors:
    a. GL-100.
    b. GL-60.
2. Paneled and Glass doors:
    a. GL-686.
    b. GL-919.
    c. GL-684.
    d. GL-673.
    e. GL-637.
    f. GL-692.
    g. GL-648.
    h. GL-659.
    i. GL-696.
    j. GL-412.
    k. GL-680.
3. Paneled and Glass with Fixed External Grille Doors:
    a. GL-686FG15.
    b. GL-686FG10.
    c. GL-686FG8.
    d. GL-636FG17.
    e. GL-684FG9.
    f. GL-684DFG.
    g. GL-692FG3.
    h. GL-659FG5.
    i. GL-626FG7.
    j. GL-648FG11.
    k. GL-662FG4.
    l. GL-637FG11.
4. Paneled and Glass with Internal Contour Grille Doors:
    a. GL-686CM15.

b. GL-686CM10.
c. GL-684CM9.
d. GL-692CM3.

5. Paneled and Glass with Internal Muntin Grille Doors:
   a. GL-686IM15.
   b. GL-686IM10.
   c. GL-684IM9.
   d. GL-692IM3.
   e. GL-659IM5.
   f. GL-662IM4.
6. Paneled and Glass with Internal Wide Muntin Grille Doors:
   a. GL-686WM15.
   b. GL-686WM8.
   c. GL-684WM9.
   d. GL-684WM4.
   e. GL-692WM4.
7. Blinds Between the Glass (BL) Doors - Triple Glazed Doorglass Blinds:
   a. GL-686BL.
   b. GL-684BL.
8. Blinds Between the Glass (BL) Doors & Grilles Between Glass:
   a. GL-686BL15.
   b. GL-686BL10.
   c. GL-684BL9.
9. Blinds Between the Glass (RLB) Doors - Raise, Lower and Tilt Doorglass Blinds:
   a. GL-686RLB.
   b. GL-684RLB.
   c. GL-692RLB.
10. Paneled and Vent Doors: GL-799.
11. Options:
    a. Grilles, Fixed: Standard style, 5/8 in (16 mm) bar with white finish.
    b. Grilles Between the Glass:
       1) Contoured style internal muntin, 11/16 in (17 mm) bar.
          a) Finish: White.
          b) Finish: Champagne.
       2) Flat style, internal muntin, 5/8 in (16 mm) bar.
          a) Finish: White.
          b) Finish: Champagne.
          c) Finish: Bronze.
       3) Flat style, wide internal muntin, 7/8 in (22 mm) bar.
          a) Finish: White.
          b) Finish: Tan.
    c. Blinds Between the Glass: Raise, lower and tilt blinds, with all-in-one control.
    d. Triple Glazed Doorglass Blinds:
       1) Raise, lower and tilt blind.
       2) Raise, lower and tilt blinds with contoured style, 11/16 in (17 mm) internal bar with white finish.
    e. Craftsman shelf.

C. Performance Requirements:
   1. Fire-Rated Door Assemblies: Meet or exceed fire-protection ratings indicated when tested in accordance with the following: NFPA 252, UL 10B, UL 10C, and CAN/ULC S104, and UBC 7-2. Provide doors complying with specified requirements, based on testing manufacturer's doors representative of those specified: AAMA 1304, ASTM E283, ASTM E330, and ASTM E331.
   2. Structural Design Pressure: Provide doors capable of complying with requirements indicated:

a. As indicated on drawings.
b. _____.

3. Impact (Windborne-Debris) Resistance: Capable of resisting impact, in accordance with ASTM E1886 and ASTM E1996.
   a. Provide doors tested in accordance with FBC Section 1626.
   b. Provide doors tested in accordance with FBC, TAS 201, TAS 202 and TAS 203.
4. NFRC Requirements: Provide doors capable of complying with the following total door ratings:
   a. U-Factor, in accordance with NFRC 100: _____.
   b. Solar Heat Gain Coefficient (SHGC), in accordance with NFRC 200: _____.

D. Materials:
1. Wood Frames: Western Pine.
   a. Preservative treated with AuraLast in accordance with WDMA I.S.4.
2. Steel Skins: Galvanized steel. 0.0195 in (0.495 mm) plus or minus 2 percent.
3. Steel Skins: Galvanized steel. 0.0175 in (0.444 mm) plus or minus 2 percent.
4. Stiles and Rails:
   a. Wood Edge Construction: 1 in (25.4 mm) Laminated Veneer Lumber (LVL).
   b. Steel Edge Construction: Galvanized Steel; 0.028 in (0.7 mm) continuous roll-formed steel.
5. Core: Custom-fitted Polystyrene.
6. Thickness: 1-3/4 in (44 mm).
   a. Fire Rating: 20 minutes.
   b. Fire Rating: 90 minutes.
7. Edge Construction:
   a. Wood.
   b. Steel.

E. Door Design:
1. Door Surface: Smooth.
2. Door Shape: Squared Top.
3. Door Style: Solid.
4. Door Style: Paneled and Glass.
5. Face Pattern: Flush.
6. Face Pattern: 1-Panel Eyebrow.
7. Face Pattern: 1-Panel Flat.
8. Face Pattern: 1-Panel Diamond Plate.
9. Face Pattern: 2-Panel Tiered.
10. Face Pattern: 2-Panel Square Top Flat.
11. Face Pattern: 2-Panel Arch Top Tiered.
12. Face Pattern: 2-Panel Plank Arch Top Tiered.
13. Face Pattern: 3-Panel Beaded.
14. Face Pattern: 4-Panel Ovolo.
15. Face Pattern: 6-Panel Beaded.
16. Face Pattern: 6-Panel Ovolo.
17. Face Pattern: 8-Panel Beaded.
18. Face Pattern: 9-Panel Beaded.
19. Face Pattern: Craftsman 3-Panel.
20. Face Pattern: Craftsman 3-Panel Flat.
21. Face Pattern: Sunburst.
22. Bottom Rail: Standard, 8-5/8 in (225 mm).
23. Bottom Rail: ADA, 10-1/8 in (257 mm).
24. Panel Profile: Beaded.
25. Panel Profile: Ovolo.
26. Panel Profile: Tiered.

27. Panel Profile: Craftsman.
28. Panel Profile: Flat Panel.
29. Sidelite Glazing Shape: 819.
30. Sidelite Glazing Shape: 690.
31. Sidelite Glazing Shape: 422.
32. Sidelite Glazing Shape: 692.
33. Sidelite Glazing Shape: 7-690.
34. Sidelite Glazing Shape: 7-692.
35. Sidelite Glazing Shape: 8-690.
36. Sidelite Glazing Shape: 8-692.
37. Sidelite Glazing Shape: Match door style.
38. Transoms Shape: Rectangle.
39. Transoms Shape: Round Top.
40. Transoms Shape: Elliptical.
41. Finish: Two-coats, low-sheen, baked-on enamel primer.
42. Hardware: None. Prep door for owner supplied hinge and lockset.
    a. Hardware Finish: Antique Brass.
    b. Hardware Finish: Brass.
    c. Hardware Finish: Satin Nickel.

2.3 PREHUNG HARDWOOD DOOR SYSTEMS

A. Profile:
1. System 01, Single Door.
2. System 03, One Door, One Sidelite.
3. System 04, One Door, Two Sidelites.

B. Jamb:
1. Material: Solid pine.
2. Material: Solid pine Auralast wood.
3. Material: Primed Pine.
4. Profile: Rabbeted.
5. Width: As selected by Architect.
6. Width: 4-9/16 in (116 mm).
7. Width: 5-1/4 in (133 mm).
8. Width: 6-9/16 in (167 mm).

C. Casing:
1. As selected by Architect.
2. Brickmould.

D. Hinges: Solid brass concealed-bearing.
1. Finish: As selected by Architect.
2. Finish: Zinc Dichromate.
3. Finish: Antique Brass.
4. Finish: Lite Brass.
5. Finish: Oil-Rubbed Bronze.
6. Finish: Bright Chrome.
7. Finish: Brushed Chrome.
8. Finish: Antique Nickel.
9. Finish: Satin Nickel.

E. Sills:
1. Aluminum with Polished Aluminum Finish.
2. Aluminum with Brass Finish.
3. Aluminum with Oil-Rubbed Bronze Finish.

2.4 GLAZING

A. Door Glazing:
1. Clear Glass: As selected by Architect.
2. Clear Glass: Clear Low-E.
3. Clear Glass: Clear.
4. Decorative Glass: As Selected by Architect.
5. Decorative Glass: Bellflower.
6. Decorative Glass: Bristol.
7. Decorative Glass: Cadence.
8. Decorative Glass: Delray.
9. Decorative Glass: Greenfield.
10. Decorative Glass: Heirlooms.
11. Decorative Glass: Impressions.
12. Decorative Glass: Jacinto.
13. Decorative Glass: Majestic.
14. Decorative Glass: Mohave.
15. Decorative Glass: Nouveau.
16. Decorative Glass: Oak Park.
17. Decorative Glass: Paris.
18. Decorative Glass: Prairie Bevel.
19. Decorative Glass: Topaz.
20. Privacy Glass: Textured Rain Glass.
21. Privacy Glass: Textured Double Glue-Chip.
22. Privacy Glass: Textured Micro-Granite.

B. Transom Glazing:
1. Match Glass Insert Style.
2. Clear.
3. Low-E.

2.5 CONSTRUCTION ACCESSORIES

A. Flashing: Refer to Section 04 20 00 - Unit Masonry.

B. Flashing: Refer to Section 07 60 00 - Flashing and Sheet Metal.

C. Sealants: OSI Sealants by Henkel Corporation.

D. Sealants: Refer to Section 07 91 23 - Backer Rods.

E. Sealants: Manufacturer recommended sealants to maintain watertight conditions.

2.6 FABRICATION

A. Construction: One-piece of polystyrene is custom fitted in standard wood stile and rail frame. Back of steel skin is coated with epoxy primer before attachment to core and frame.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect doors prior to installation. Verify doors are suitable for installation

B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

B. Install Jamb Assembly:
   1. Caulk sill along outside edge and 1/2 in (13 mm) in from edge of subfloor.
   2. Set door unit into center of opening and tack in place.
   3. Shim hinge then latch side jambs straight. Inspect jamb for square, level and plumb.
   4. Shim and fasten top of unit where sidelite joins door jamb.
   5. Fasten hinge side jamb to studs.
   6. Verify door opens freely and weatherstrip meets door evenly.
   7. Verify door sweep contacts threshold evenly.
   8. Fasten latch side jamb to studs.

C. Install Transom:
   1. Apply caulk on top of door head jamb.
   2. Set transom jamb on door head jamb and fasten.
   3. Shim transom straight. Inspect transom for square, level and plumb.
   4. Fasten transom to studs.

D. Caulk outside perimeter of door unit between brickmold and wall face, along front side of threshold, and between jamb sides and threshold.

3.3 PROTECTION

A. Protect installed doors from damage.

3.4 SCHEDULES

A. Door Type A:
   1. Basis of Design: Contours. Model Number: _____ as manufactured by Jeld-Wen.
   2. Thickness: 1-3/4 in (44 mm).
   3. Steel Thickness: Galvanized steel; 0.0195 in (0.49 mm) plus or minus 2 percent.
   4. Fire Rating: _____.
   5. Edge Construction: _____.
   6. Door Design:
      a. Surface: _____.
      b. Shape: _____.
      c. Style: _____.
      d. Face Pattern: _____.
   7. Sidelites: _____.
   8. Transom: _____.
   9. Sticking Profile: _____.
   10. Finish: Baked enamel primer.
   11. Hardware Finish: _____.
   12. Profile: _____.
   13. Jamb: _____.
      a. Profile: _____.
      b. Width: 4-9/16 in (116 mm).
   14. Casing: _____.
   15. Hinges: _____.
   16. Sill: _____
   17. Glass Inserts: _____.

B. Door Type B:
   1. Basis of Design: Gladiator, Model Number: _____ as manufactured by Jeld-Wen.
   2. Thickness: 1-3/4 in (44 mm).
   3. Steel Thickness: Galvanized steel; 0.0175 in (0.44 mm) plus or minus 2 percent.

4. Fire Rating: None.
5. Edge Construction: Wood.
6. Door Design:
    a. Surface: _____.
    b. Shape: _____.
    c. Style: _____.
    d. Face Pattern: _____.
7. Sidelites: _____.
8. Transom: _____.
9. Sticking Profile: _____.
10. Finish: Baked enamel primer.
11. Hardware Finish: _____.
12. Profile: _____.
13. Jamb: _____.
    a. Profile: _____.
    b. Width: 5-1/4 in (133 mm).
14. Casing: _____.
15. Hinges: _____.
16. Sill: _____
17. Glass Inserts: _____.

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior wood doors of the following types:
   1. Raised panel doors.

1.2 REFERENCES

A. American with Disabilities Act (ADA).

B. National Fire Protection Association (NFPA): NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Indicate locations of blocking and reinforcements required for installing wood doors.

D. Verification Samples: For each finish product specified, two samples, representing actual product, color, and finish.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

F. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic checking and adjustment, cleaning and maintenance of wood doors.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum five years experience in manufacturing wood doors.

B. Installer: Experienced with installation of similar products, and acceptable to the manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of fabrication techniques and application workmanship.
   1. Install in areas designated by Architect.
   2. Do not proceed with remaining work until installation is approved by Architect.
   3. Rebuild mock-up until satisfactory results are achieved.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in the manufacturer's unopened packaging until ready for installation.

B. Protect finished surfaces from soiling or damage during handling and installation.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty for materials.

PART 2 EXECUTION

2.1 EXAMINATION AND PREPARATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

2.2 INSTALLATION

A. Install products in strict accordance with manufacturer's instructions and approved submittals.
   1. Follow manufacturer's recommendations for attachment.
   2. Adjust to open and close smoothly and freely without binding.

2.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 08 33 00
COILING DOORS AND GRILLES

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies coiling doors of sizes shown, complete as specified.

1.2 RELATED WORK

A. Lock cylinders for cylindrical locks: Section 08 71 00, DOOR HARDWARE.

B. Field painting: Section 09 91 00, PAINTING.

C. Electric devices and wiring: DIVISION 26, ELECTRICAL.

D. Deal trays of a Forced Entry/Ballistic Resistant rating: Section 08 56 59.

1.3 MANUFACTURER'S AND INSTALLER'S QUALIFICATIONS

A. Coiling doors shall be products of manufacturers regularly engaged in manufacturing items of type specified.

B. Install items under direct supervision of manufacturer's representative or trained personnel.

1.4 FIRE DOOR REQUIREMENTS

Where fire doors exceed the size for which testing and labeling is available, submit certificates stating that the doors and hardware is identical in design, materials, and construction to a door that has been tested and meets the requirements for the class indicated.

1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings:

1. Each type of door showing details of construction, accessories and hardware, electrical and mechanical items supporting brackets for motors, location, and ratings of motors, and safety devices.
2. Wiring diagrams for motors and controls, including wiring diagram for door, showing electrical interlock of motor with manually operated dead lock.

C. Manufacturer's Literature and Data:

1. Brochures or catalog cuts, each type door or grille.
2. Manufacturer's installation procedures and instructions.
3. Maintenance instructions, parts lists.

D. Certificates:

1. Attesting doors, anchors and hardware will withstand the horizontal loads specified.
2. Attesting oversize fire doors and hardware are identical in design, material, and construction to doors that meet the requirements for the class specified.

1.6 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

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

A36/A36M-08..... Structural Steel

A167-99(R2009) ..... Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

A653/A653M-10..... Steel Sheet, Zinc-Coated (Galvanized) Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

B209/209M-07 ..... .Aluminum and Aluminum-Alloy Sheet and Plate

B221/B221M-08..... Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

C. National Electrical Manufacturers Association (NEMA):

ICS 1-00(R2008) ..... Industrial Control and Systems General Requirements

ICS 2-00(R2005) ..... Industrial Control, and Systems, Controllers, Contactors, and Overload Relays

ICS 6-93 (R2006) ..... Industrial Control and Systems Enclosures

MG 1-10..... Motors and Generators

ST 20-92 (Rl997) ..... Dry-Type Transformers for General Applications

D. Master Painters Institute (MPI):

MPI #35 ..... Exterior Bituminous Coating

MPI #76 ..... Quick Drying Alkyd Metal Primer

E. National Fire Protection Association (NFPA):

70-11 ..... National Electrical Code 1999 Edition

80-10 ..... Fire Doors and Fire Windows

F. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series..... Metal Finishes Manual

G. Underwriters Laboratories, Inc. (UL):

2010..... Fire Resistance Directory

PART 2 - PRODUCTS

2.1 MATERIAL

A. Steel: A653 for forming operation. ASTM A36 for structural sections.

B. Alkyd Metal Primer: MPI No. 76.

C. Bituminous Coating: MPI No. 35.

2.2 DESIGN REQUIREMENTS

A. Coiling doors shall be spring counter balanced, overhead coiling type, inside face mounted with guides at jambs set back a sufficient distance to provide a clear opening when door is in open position.

B. Doors, hardware, and anchors shall be designed to withstand a horizontal or wind pressure of 958 Pa (20 psf) of door area without damage.

C. All motor operators shall have manual emergency mechanical operators.

D. Fire rated doors shall conform to the requirements specified herein and to NFPA 80 for the class indicated. Doors shall bear Underwriters Laboratories, Inc. label indicating the applicable fire rating.

E. Where doors in excess of 7.4 m^2 (80 sf) are indicated to be manually operated, provision shall be made in the design and construction that will permit future installation of electric-power operation.

F. The coiling door shall be superimposed over the coiling grille in a common assembly where dual installation is required.

2.3 FABRICATION

A. Curtains:

1. Form of interlocking slats of galvanized steel of shapes standard with the manufacturer, except that slats for exterior doors shall be flat type.
2. Thickness of slats shall be as required to resist loads specified except not less than the following:
    a. For doors less than 4500 mm (15 feet) wide: 0.75 mm (0.0299 inch).
    b. For doors from 4530 mm (15 feet 1 inch) to 6300 mm (21 feet wide): 0.90 mm (0.0359 inch).
    c. For doors wider than 6330 mm (21 feet 1 inch): 1.20 mm (0.0478 inch).
3. Thickness of aluminum slats shall be as follows:
    a. For doors less than 4500 mm (15 feet wide): 1 mm (0.040 inch).
    b. For doors from 4530 mm (15 feet 1 inch) to 6300 mm (21 feet wide): 1.45 mm (0.057 inch).
    c. For doors wider than 6330 mm (21 feet 1 inch): 1.65 mm (0.064 inch).

B. Grilles:

1. Form of galvanized steel.
2. Horizontal rods, 8 mm (5/16 inch) minimum diameter spaced not over 50 mm (two inches) on center with hinged vertical connecting links. Links shall be spaced not over 225 mm (nine inches) apart.
3. Provide tubular bottom rail at bottom end of grille.

C. Endlocks and Windlocks:

1. Manufacturer's stock design of galvanized malleable iron or galvanized steel or stamped cadmium steel for doors
2. The ends of each slat for exterior doors and each alternate slat for grilles and interior doors shall have endlocks.

3. Doors shall have windlocks at ends of at least every sixth slat. Windlocks shall prevent curtain from leaving guide because of deflection from wind pressure or other forces.

D. Bottom Bar:
   1. Two angles of equal weight, one on each side, standard extruded aluminum members not less than 3 mm (0.125 inch) thick.
   2. Bottom bar designed to receive weather-stripping and safety device, and be securely fastened to bottom of curtain or grille.

E. Barrel and Spring Counterbalance:
   1. Curtain shall coil on a barrel supported at end of opening on brackets and be balanced by helical springs.
   2. Barrel fabricated of steel pipe or commercial welded steel tubing of proper diameter and thickness for the size of curtain, to limit deflection with curtain rolled up, not to exceed 1 in 400 (0.03 inch per foot) of span.
   3. Close ends of barrel with cast iron plugs, machined to fit the opening.
   4. Within the barrel, install an oil-tempered, helical, counter balancing steel spring, capable of producing sufficient torque to assure easy operation of the door curtain from any position.
   5. At least 80 percent of the door weight shall be counter balanced at any position.
   6. Spring-tension shall be adjustable from outside of bracket without removing the hood or motor operator.

F. Brackets:
   1. Steel plate designed to form end closure and support for hood and the end of the barrel assembly.
   2. End of barrel or shaft shall screw into bracket hubs fabricated of cast iron or steel.
   3. Equip bracket hubs or barrel plugs with prelubricated ball bearings, shielded or sealed.

G. Hoods:
   1. Steel galvanized, 0.6 mm (0.0239 inch) thick.
   2. Form hood to fit contour of end brackets.
   3. Reinforce at top and bottom edges with rolled beads, rods or angles. Hoods more than 3600 mm (12 feet) in length shall have intermediate supporting brackets.
   4. Fasten to brackets with screws or bolts and provide for attachment to wall with bolts.
   5. Provide a weather baffle at the lintel or inside the hood of each exterior door to minimize seepage of air through the hood enclosure.

H. Guides:
   1. Manufacturer's standard formed sections or angles of steel.
      a. Steel sections not less than 5 mm (3/16 inch) thick.

2. Form a channel pocket of sufficient depth to retain the curtain in place under the horizontal pressure specified, and prevent ends of curtain from slipping out of guide slots.
3. Top sections flared for smooth entry of curtain to vertical sections that will facilitate entry of curtain.
4. Provide stops to limit curtain travel above top of guides.
5. Provide guide of aluminum with replaceable wear strips to prevent metal to metal contact.
6. Mounting brackets shall provide closure between guides and jambs.

I. Weather-stripping:
1. Manually Operated Doors: Exterior doors shall have a compressible and replaceable rubber, neoprene, or vinyl weather seal attached to bottom bar.
2. Motor Operated Doors: Bottom bar safety device shall be a combination compressible seal and safety device as specified in paragraph, ELECTRIC MOTOR OPERATORS.
3. At exterior doors provide replaceable sweep type continuous vinyl or neoprene weather seals on guides and across head on exterior to seal against wind infiltration.

J. Locking:

1. Cylinder locks shall receive standard screw in cylinders furnished under Section, 08 71 00 DOOR HARDWARE.
2. For motor operated doors provide manufacturer's standard cylinder dead lock type locking device on the inside, key operated from both sides, interlocked with motor to prevent motor from operating when locks are activated.

2.4 ELECTRIC MOTOR OPERATORS

A. Provide operators complete with electric motor, machine cut reduction gears, steel chain and sprockets, magnetic brake, overload protection, brackets, push button controls, limit switches, magnetic reversing contactor, and other accessories necessary for proper operation including emergency manual operator.

B. Design:
1. Design the operator so that the motor may be removed without disturbing the limit-switch timing and without affecting the emergency manual operators.
2. Make provision for emergency manual operation of door by chain-gear mechanism.
3. Arrange the emergency manual operating mechanism so that it may be immediately put into and out of operation from the floor with an electrical or mechanical device, which will disconnect the motor from the operating mechanism when the emergency manual operating mechanism is engaged, and its use shall not affect the timing of the limit switches, in case of electrical failure.
4. Provide interlock with motor to prevent motor from operating when manual locks are activated.

C. Motors:
    1. Motors shall conform to NEMA MG1, suitable for operation on current of the characteristics indicated, and shall operate at not more than 3600 rpm.
    2. Motors shall be high starting torque, reversible type, of sufficient horsepower and torque output to move the door in either direction from any position, and produce a door travel speed of not less than 0.66 foot or more than one foot per second, without exceeding the rated capacity.
D. Controls:
    1. The control equipment shall conform to NEMA ICS 1 and 2.
    2. Control enclosures shall be NEMA ICS 6, Type 12 or Type 4, except that contractor enclosures may be Type 1.
    3. Remote control switches shall be at least 1500 mm (5 feet) above the floor line, and located so that the operator will have complete visibility of the door at all times.
    4. Each door motor shall have an enclosed, across-the-line type, magnetic reversing contactor, thermal overload protection, solenoid operated brake, limit switches, and remote control switches at locations shown.
    5. Use key activated switches on exterior requiring constant pressure to operate.
    6. Use three-button type, push button switch on interior, unless noted to be key activated, with the buttons marked, OPEN, CLOSE, and STOP.
        a. The OPEN and STOP buttons shall be of the type requiring only momentary pressure to operate. The CLOSE button shall be of the type requiring constant pressure to maintain the closing motion of the door. When the door is in motion, and the STOP button is pressed, the door shall stop instantly and remain in the stop position; from the stop position, the door may then be operated in either direction by the OPEN or Close buttons.
        b. Push buttons shall be full-guarded to prevent accidental operation.
    7. Provide limit switches to automatically stop the doors at their fully open and closed positions. Positions of the limit switches shall be readily adjustable.
    8. Safety device:
        a. The bottom bar of power-operated doors shall have a fail safe safety device that will immediately stop and reverse the door in its closing travel upon contact with an obstruction in the door opening, or upon failure of the device, or any component of the device, or any component of the control system, and cause the door to return to its full open position. The door closing circuit shall be electrically locked out, and the door shall be operable manually until the failure or damage has been corrected.
        b. Safety device shall not be used as a limit switch.

c. Safety device connecting cable to motor shall be flexible "Type SO" cable and spring loaded automatic take up reel or equivalent device, as required for proper operation of the doors.

9. Transformer:
   a. Provide a control transformer in power circuits as necessary to reduce the voltage on the control circuits to 120 volts or less.
   b. The transformer shall conform to NEMA ST20.
10. Electrical components shall conform to NFPA 70. Electrical materials, equipment, and devices for installation in hazardous locations as defined by NFPA 70 shall be specifically approved by Underwriters Laboratories for the particular chemical group and the class and division of hazardous location involved.

2.5 MANUAL OPERATORS

A. Push-up Operation:
   1. Provide one lifting handle on each side of door and counterbalance in a manner to provide easy operation while raising or lowering the curtain by hand.
   2. The maximum exertion or pull required for lift handle operation shall not exceed 1197 Pa (25 psf).
   3. Provide pull-down straps or pole hooks on bottom rail of doors over 2100 mm (7 feet) high.

B. Hand Chain Operation:
   1. Galvanized, endless chain operating over a sprocket and extending to within 900 mm (3 feet) of floor.
   2. Obtain reduction by use of suitable permanently lubricated gearing connected by roller chain and sprocket drive.
   3. Calculate gear reduction to reduce pull required on hand chain, not to exceed 1676 Pa (35 psf).

C. Crank Operation:
   1. Locate crank approximately 854 mm (34 inches) above the floor.
   2. Connect vertical shaft, gear box, and gears to curtain.
   3. Calculate gear reduction to reduce pressure exerted on crank to not over 958 Pa (20 pounds).

2.6 FIRE DOORS

A. B-labeled fire doors shall be complete with hardware, accessories, and automatic closing device as required by NFPA 80.

B. Equip fire doors with an automatic closing mechanism actuated by fusible links to release at 54 ^{o}C (130 ^{o}F).

C. Doors shall be forced into a closed position by an auxiliary spring in the barrel which is inoperative during normal operation and when activated will not affect the adjustment of the

counterbalance spring. The auxiliary spring shall exert pressure on the curtain until the release device is reset. Door shall come to rest on the floor without impact.

D. Control descent of curtain by an oscillating governor.

E. Provide handles for push up operation.

2.7 FINISHES

A. Steel:

1. Clean surfaces of steel free from scale, rust, oil and grease, and then apply a light colored shop prime paint after fabrication.
2. Non-galvanized steel: Treat to assure maximum paint adherence, and apply corrosion inhibitive primer.
3. Galvanized steel: Apply a phosphate treatment and a corrosion inhibitive primer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install doors and grilles in accordance with approved shop drawings and manufacturer's instructions.

B. Locate anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories accurately.

C. Securely attach guides to adjoining construction with not less than 9 mm (3/8 inch) diameter bolts, near each end and spaced not over 600 mm (24 inches) apart.

D. Locate control switches where shown.

E. Install all electric devices and wiring as specified in DIVISION 26 ELECTRICAL and DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

3.2 REPAIR

A. Repair prime painted zinc-coated surfaces and bare zinc-coated surfaces that are damaged by the application of galvanizing repair compound. Spot prime all damaged shop prime painted surfaces including repaired prime painted zinc-coated surfaces.

B. Coiling Doors shall be lubricated, properly adjusted, and demonstrated to operate freely.

3.3 PROTECTION

A. Isolate aluminum in contact with or fastened to dissimilar metals other than stainless steel, white bronze or other metals not compatible with aluminum by one of the following:

1. Paint the dissimilar metal with a prime coat of zinc-Molybdate or other suitable primer, followed by two coats of aluminum paint.
2. Place an approved caulking compound, or a non-absorptive tape, or gasket between the aluminum and the dissimilar metal.

B. Paint aluminum in contact with or built into mortar, concrete, plaster or other masonry materials with a coat of bituminous paint.

C. Paint aluminum in contact with wood or other absorptive materials, that may repeatedly become wet, with a coat of bituminous paint or two coats of aluminum paint.

3.4 INSPECTION

Upon completion, doors shall be weather tight, and doors shall be free from warp, twist, or distortion.

END OF SECTION

SECTION 08 51 13

ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SECTION REQUIREMENTS

A. Provide Aluminum Jalousies Windows as per Construction Drawings.

1.2 RELATED STANDARD

A. Except as otherwise indicated, the requirements for aluminum windows, and the terminology and standard of performance and fabrication workmanship are those specified and recommended in ANS A 134,.1, and the applicable general recommendations published by AAMA, NAAM and AA.

1.3 SUBMITTALS

A. Manufacturer's Data

1. Prior to installation of any work, submit for Architect's approval, manufacturer's specification, recommendations and standard details for aluminum window units, including fabrication, finishing, hardware and other components of the work. Include certified test laboratory report as necessary to show compliance with the requirements. Refer to Division 1 for additional submittals requirements.

B. Samples

1. Submit 3 samples of required finish, on 2 inches long sections of extrusion shapes as required for the window and louvers units. Where color or texture of finish will vary slightly for the work, include 2 or more sections in each sample, to show the limits of such variations.

2. Submit 2 copies of written guarantee signed by the Manufacturer and Contractor, agreeing to replace aluminum window units which fail in materials or workmanship within one (1) year of the date of acceptance. Failure of materials or workmanship shall include (but not be limited to) excessive leakage or air infiltration, excessive deflections, and defects in hardware, and other components of the work.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Provide window units produced by one of the following manufacturers, or approved substitution of another manufacturer of the required sizes, and performance characteristics.

1. Air Master Manufacturing, Co.

2.2 MATERIALS

A. The required sizes for window units are shown one or more manufacturers. It is that similar details by other manufacturers will be acceptable, provided they comply with the size requirements, and minimum profile requirements as approved by Architect.

B. Jalousies

1. Louvers shall be of the jumbo type.

C. All window members, including head, sill, jambs, travel bar and louver blades shall be formed from aluminum coil material allow #3003-H-16 with a minimum tensile strength of 24,000 PSI and thickness of .062", within commercial tolerance.

D. Glass jalousies shall be ¼ inch safety glass, 4 inches wide, solar gray.

E. Operators

1. Operators shall be equal or similar to heavy duty model SD-500 of Caribbean Die Casting Corp. Housing shall be cast in a single piece of Zamak No. 3 with no screws. Handle shall be Zamak No. 5 butterfly type. Sector gear, bushing and solid pin, tempered Ledloy steel made on screw machine. Provide 4 borings for attachments to window.

2. The operators shall be located on left or right side, as may be required by job conditions. Units 4'-0" high and over, shall have two (2) operators per unit.

F. Fasteners

1. Clips, bolts, and screws shall be of aluminum, stainless steel or other metallic materials guaranteed by the manufacturer to be non-corrosive and compatible with the aluminum window member operator, anchors and other components of the window units.

G. Sealant

1. Unless otherwise indicated, provide type guaranteed to remain permanently elastic, nonshrinking and non-migrating.

H. Window Finish

1. Windows shall be furnished with two coats of baked enamel paint, factory applied. Color shall be as selected by Architect.

2.3 WINDOWS PERFORMANCE REQUIREMENTS

A. Except as otherwise indicated, comply with the air infiltration tests, water resistance tests and applicable load tests specified in ANS 134.1 (sponsored by AAMA).

B. Window shall comply with ASCE-7, IBC-2009, and Puerto Rico Building Code 2011.

2.4 FIXED LOUVER

A. Shall be as Model 80, Series 1970 with aluminum screen, constructed of aluminum extrusion 6063-T-S of .80 inch minimum thickness, and of sizes indicated on drawings.

2.5 TESTING

A. Wherever manufacturer's standard window units comply with the requirements and have been tested in accordance with the specified tests, provide certification by the manufacturer of compliance with such tests; otherwise, perform the required tests through a recognized testing laboratory and provide certified test results.

2.6 AUXILIARY WINDOW UNIT COMPONENTS

A. Provide mullions as shown, matching window units. Aluminum mullions for windows of more than five (5) feet in height shall be "T" shape extruded aluminum, of not less than ¼ inch thickness. Secure windows to the mullions with aluminum screws or rivets ¼ inch in diameter spaced not over 1-6" center to center. Embed both ends of the mullions into the concrete of the window opening.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's specifications for the installation of window units, operators, and other components for the work.

B. Set units plumb, level and true to line, without warp or rack of frames or jalousies. Anchor securely in place to masonry at heads and jambs with ¼ inch diameter aluminum bolts with steel expansion shields (wood plugs & wood screws will not be accepted. Bolts shall be of sufficient length to penetrate into the concrete a minimum of 1 ½ inches. Bolts for fastening

frames to masonry shall be placed not over 1'-6" center to center. Use not less than two (20 bolts on each side.)

C. Set and anchor firmly to concrete or masonry as detailed on the drawings or as approved.

D. Separated unpainted surfaces of aluminum windows from concrete or masonry by applying a heavy protective coating of an alkali resistant bituminous paint. Surfaces of aluminum which will come in contract with dissimilar metals (except stainless steels) shall also be coated with bituminous paint or a zinc chromate priming paint.

E. Caulk windows at all intersections with masonry openings and as required by the detail drawings. Caulking shall be forced into the voids or corners in a continuous full head tooled to an even surface with straight edges. Joints shall be completely watertight.

F. Adjust operator to provide a tight fit at contact points, for smooth operation and weather-tight closure.

G. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to the paint. Remove excess sealant compound, dirt and other substances. Lubricate hardware and other moving parts.

END OF SECTION 08 51 13

SECTION 08710
BUILDERS HARDWARE

1. GENERAL:

1.1 SECTION INCLUDES:

A. Builders hardware for doors.

1.2 RELATED SECTIONS:

A. Hollow metal doors and frames - Section 08110.

1.3 REFERENCES:

A. American National Standards Institute (ANSI):

1. ANSI 156.1-1988 - Butts and hinges.
2. ANSI 156.2-1983 - Bored & preassembled locks.
3. ANSI 156.3-1984 - Exit devices.
4. ANSI 156.4-1986 - Door control (Closer).
5. ANSI 156.5-1984 - Auxiliary locks.
6. ANSI 156.13-1987- Mortise locks & latches.
7. ANSI 156.16-1989- Auxiliary hardware.
8. ANSI 156.18-1987- Materials & finishes.
9. ANSI 117. 1-1986- Providing accessibility and usability for physical handicapped people.

B. National Builders Hardware Association (NBHA):

1. Recommended Locations for Builders Hardware -1975.
2. Basic Builders Hardware - October 1969.

C. Builders Hardware Manufacturers Association:

1. Directory of Certified Locks & Latches -June 1989.
2. Directory of Certified Door Closers - July 1989.

D. National Fire Protection Association (NFPA):

1. NFPA 80 -Fire Doors and Windows.
2. NFPA 101-Life Safety Code 1988

E. Building Code “Reglamento de Edificación-P.R.:
1.”Reglamento de Planificación Núm. 7".
2.”Enmiendas al Reglamento de Edificación”.

1.4 QUALITY ASSURANCE:

A. Hardware shall conform to the following standards:

1. All butts shall comply with ANSI A2112 and A2133.

   a. Butts on outswing exterior doors shall have non-removable pins (NRP).
   b. Provide Ball Bearing Hinges at Self Closing Doors

2. Locksets and latches shall meet the following minimum ANSI standards.

a. Heavy duty cylindrical locks -ANSI Series 4000, Grade 1.
b. Mortise Locks-ANSI Series 1000, Grade 1 test requirements.
c. Use UL approved locks on labeled fire doors.

3. Door closers shall comply with ANSI Series C02011, Grade 1 with cast iron case and adjustable backcheck. Closers for reverse bevel doors and all doors opening towards a hallway shall comply with ANSI Series CO2021, Grade 1 and be sized according to the manufacturers's recommendation.

4. Exit devices shall be of the modern push bar type, ANSI Grade 1. All pair openings with a combination mortise and vertical rod device shall be equipped with an open back strike. Pair openings with a combination Rim and vertical rod device and door closers on each doors shall be equipped with a type 21 door coordinator.

1.5 SUBMITTALS

A. The hardware supplier shall submit seven (7) copies of a complete hardware schedule for approval. See Division 1 of the Specification.

1. Preface sheet listing category only and manufacturers name of items being furnished, as follows:

Category	Specified	Scheduled
Hinges	Mfg."A"	Mfg."B"
Locksets	Mfg."C"	Mfg."D"
Kickplates	Open	Mfg."X"

2. For hardware locations, see Article 3.3 - Locations.

3. Open description: Single or pair, number, room locations, hand, active leaf, degree of opening, size, material, frame material, and fire rating.

4. Hardware description: Quantity, category, product number, fasteners, and finish.

5. Headings that refer to the specified Hardware Set Numbers.

6. Scheduling sequence shown in Hardware Sets.

7. Product data of each hardware item and shop drawings, where required, for special conditions and specialty hardware.

8. Vertical scheduling format only. Horizontal schedules are not acceptable.

9. Typed copy.

10. Double spacing.

11. Eight and one-half by eleven inch (8 1/2"x 11") sheets.

12. U.S. Standards finish symbols.

B. Samples: Submit sample of each type of builders hardware item proposed for project. If approved, samples may be used in project.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Package and deliver hardware items separately and mark each to correspond with heading numbers on hardware schedule.

B. Include necessary instructions, templates, drawings and fasteners for proper installation.

1.7 JOB CONDITIONS:

A. The hardware manufacturer or its representative must furnish the hardware template drawings required in the fabrication of doors for this project.

B. See Article 3.3 - Locations, and coordinate with templates.

C. Sub-contract the furnishing of builders hardware to a recognized local builders hardware representative for the lockset being furnished. The local hardware supplier must have been furnishing builders hardware for a period of not less than 5 years and must have in his employment an experienced hardware consultant who is available at all reasonable times during the course of the work for project hardware consultation to the owner or architect. Hardware supplier must furnish all hardware required to comply pertinent government regulations from American Disability Act, and National Fire Protection Association.

1.8 REGULATORY REQUIREMENTS

Contractor must provide hardware to conform to:

1. All applicable codes for fire rated doors and frames.
2. All applicable sections of Chapter 5 of N.F.P.A. 101.
3. ANSI A117.1 for hardware locations and requirements to meet all handicapped codes of the American with Disabilities Act.
4. Quantities shown on schedule are for reference only. Final count is the contractors responsibility.

2. PRODUCTS:

2.1 MANUFACTURERS:

A. General:

1. Products are listed in a brand name only to establish a standard of quality.
2. Equivalent products, as described in section 2.2 of these specifications, are acceptable substitutions.

B. Locks and latches:

1. Corbin Russwin
2. Sargent.

C. Door Closers:

1. Corbin Russwin.
2. Dorma
3. LCN
4. Sargent

D. Manufacturers of other items:

1. Butts: Soss, Hager, McKinney or Lawrence
2. Exit Devices: Corbin Russwin, Sargent, Von Duprin
3. Floor Closers & Pivots: Dorma or McKinney
4. Overhead Door Holders: Corbin Russwin -Sargent
5. Door Pulls: Rockwood, Trimco, Hager
6. Protective Plates: Rockwood, Trimco, Hager
7. Bolts: Rockwood, Trimco, Hager
8. Stops: Rockwood, Trimco-Hager
9. Electromagnetic Locks and Holders-Von Duprin
10. Padlocks -American- Corbin Russwin

2.2 LABEL REQUIREMENTS:

A. Furnish Underwriters Laboratories, Inc. approved hardware items, meeting requirements of NFPA 80, at doors scheduled to be label doors.

2.3 FINISHES:

Unless otherwise specified on hardware schedule all finishes will be as follows:

A. Butts and Pivots: 630
B. Locksets, Deadlocks, Padlocks and Latches: 626 (Except MS1850-628).
C. Exit Devices: 626.
D. Closers: Sprayed aluminum to match; 626 on Floor Type.
E. Pulls & Plates: 630.
F. Stops/Holders: 626.
G. Thresholds: 628.
H. Flush Bolts: 626.

2.4 KEYING:

A. Key and master key in accordance with owner's requirements and approved keying schedule. Furnish 3 change keys for each lock, and 3 ea. Master keys, and 10 construction keys.

B. Where specified all cylinders shall be of the high security Type with interlocking pins and skew out key bitting.

C. Furnish a complete key control system that provides tags for each individual change key and a key cabinet that will hold 150% of the key capacity of the building.

3. EXECUTION:

3.1 EXAMINATION:

A. Examine door frames and related items for conditions that would prevent proper application of builders hardware.

B. Do not proceed until defects are corrected, with approval obtained from owner or his designated representative.

3.2 INSTALLATION:

A. Install hardware according to manufacturer's printed instructions and to template dimensions. See Article 1.6.
B. All hardware shall be installed in a neat workmanlike manner by experienced workmen and left in perfect working condition. Any hardware lost or damaged shall be replaced at no additional cost to the owner.

3.3 LOCATIONS:

A. Dimensions are from finish floor to center line of items.

B. This list to be included in Hardware Schedule:

Category	Dimension
Hinges	Door manufacturer standards
Flush Bolt Levers	72" and 12"
Knobs	Door manufacturer standard
Exit Device Crossbars	Manufacturer’s Template
Push Plates	52"
Pull Plates	42"
Wall Stops	At Head

3.4 FINAL ADJUSTMENT:

A. Provide the services of a representative to inspect material furnished and its installation and adjustment, to make final hardware adjustment, and to instruct the Tenant's personnel in adjustment, care and maintenance of the hardware.

3.5 HARDWARE SETS:

SECTION 08 91 00
LOUVERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Louvers and accessories including the following:
1. Fixed, extruded-aluminum louvers.
2. Fixed, formed-metal louvers.
3. Fixed, acoustical louvers.
4. Operable, extruded-aluminum louvers.
5. Operable, formed-metal louvers.
6. Operable, extruded-aluminum insulated louvers.
7. Operable, formed-metal insulated louvers.
8. Louver screens.
9. Blank-off panels.

1.2 RELATED SECTIONS

A. Section 08 11 00 - Metal Doors and Frames.

B. Section 09 90 00 - Painting and Coating.

1.3 REFERENCES

A. ASTM International (ASTM):
1. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
2. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
3. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
4. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
5. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
6. ASTM E 413 - Classification for Rating Sound Insulation.
7. ASTM E 966 - Standard Guide for Field Measurements of Airborne Sound Attenuation of Building Facades and Facade Elements.
8. ASTM E 1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation.

B. American Architectural Manufacturers Association (AAMA):
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

C. Air Movement and Control Association International, Inc. (AMCA):
1. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.
2. AMCA 501 - Louver Application Manual and Design Guide.

D. Sheet Metal & Air Conditioning Contractors' National Association (SMACNA):
   1. SMACNA - Architectural Sheet Metal Manual.

1.4 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

D. Delegated Design Submittal: For louvers indicated to comply with structural performance requirements, including analysis provided by manufacturer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified. Louver shall be licensed to bear the AMCA certified ratings seal.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Airline Louvers, a Mestek company, which is located at: 1020 Prince Frederick Blvd. Suite 305; Prince Frederick, MD 20678; Tel: 570-420-7079; Fax: 570-

420-7078; Email:request info (airlinebids@airlinelouvers.com); Web:http://info.mcdlg-hvac.com/airlinelouvers

B. Substitutions: Not permitted.

C. Substitutions: Subject to approval products manufactured by Air Balance, Arrow United Industries, Cesco Products, and Louvers and Dampers will be acceptable.

D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building:
1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
2. Wind Loads: Determine loads based on a uniform pressure of 20 lbf/sq. ft. (957 Pa), acting inward or outward.
3. Wind Loads: Determine loads based on pressures indicated below:
   a. Corner Zone: Within ____ feet of building corners, uniform pressure of _____, acting inward, and _____, acting outward.
   b. Other Than Corner Zone: Uniform pressure of _____, acting inward, and _____, acting outward.

C. Windborne-Debris-Impact Resistance: Louvers located within 30 feet (9.1 m) of grade shall pass large-missile testing requirements in ASTM E 1996, when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than louvers indicated for use on Project.
1. Protection level: Basic.
2. Protection level: Enhanced.
3. Wind Zone: 1.
4. Wind Zone: 2.
5. Wind Zone: 3
6. Wind Zone: 4
7. Component Importance Factor: 1.0.
8. Component Importance Factor: 1.5.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change (Range): 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.

F. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

G. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Non-Drainable-Blade Louver:
1. Basis of Design: Model AS15B30H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 1.5 inches (38 mm).
   b. Blade Profile: Non-Drainable blade with center baffle.
   c. Blade Spacing: 1.5 inches (38 mm).
   d. Blade Angle: 30 degrees.
   e. Free Area: 7.37 sq ft (0.68 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: Intake 0.14 inch wg (35 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity. Exhaust .153 in. w.g. at 1000 fpm (5.1 m per sec).
   g. Point of Beginning Water Penetration: 459 fpm (2.3 m per sec).
2. Basis of Design: Model AS2B45H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 2 inches (50 mm).
   b. Blade Profile: Non-Drainable blade with center baffle.
   c. Blade Spacing: 2.75 inches (70 mm).
   d. Blade Angle: 45 degrees.
   e. Free Area: 7.23 sq ft (0.67 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.15 inch wg (37 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 748 fpm (3.8 m per sec).
   h. Continuous line.
3. Basis of Design: Model AS4S45H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Non-Drainable blade.
   c. Blade Spacing: 4 inches (100 mm).
   d. Blade Angle: 45 degrees.
   e. Free Area: 9.09 sq ft (0.84 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.16 inch wg (40 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 886 fpm (4.5 m per sec).
   h. Continuous line.
4. Basis of Design: Model AS4B45H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Non-Drainable blade with center baffle.
   c. Blade Spacing: 4 inches (100 mm).
   d. Blade Angle: 45 degrees.
   e. Free Area: 9.02 sq ft (0.84 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.145 inch wg (36 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 932 fpm (4.7 m per sec).
   h. Continuous line.
5. Basis of Design: Model AS4S37H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Non-Drainable blade.
   c. Blade Spacing: 3.5 inches (89 mm).
   d. Blade Angle: 37 degrees.

e. Free Area: 9.16 sq ft (0.85 sqm) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
f. Pressure Drop: 0.121 inch wg (30 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
g. Point of Beginning Water Penetration: 876 fpm (4.5 m per sec).
h. Continuous line.

6. Basis of Design: Model AS4B30H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Non-Drainable blade.
   c. Blade Spacing: 3 inches (76 mm).
   d. Blade Angle: 30 degrees.
   e. Free Area: 7.66 sq ft (0.71 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: Intake 0.108 inch wg (27 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity. Exhaust 0.121 inch wg at 1000 fpm (5.1 m per sec).
   g. Point of Beginning Water Penetration: 763 fpm (3.9 m per sec).
   h. Continuous line.
7. Basis of Design: Model AS6B45H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (150 mm).
   b. Blade Profile: Non-Drainable blade with center baffle.
   c. Blade Spacing: 5.375 inches (137 mm).
   d. Blade Angle: 45 degrees.
   e. Free Area: 8.73 sq ft (0.81 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.13 inch wg (32 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 1093 fpm (5.6 m per sec).
   h. Continuous line.
8. Basis of Design: Model AS1S30H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 0.465 inches (11.8 mm).
   b. Blade Profile: Non-Drainable blade.
   c. Blade Spacing: 0.775 inches (19.7 mm).
   d. Blade Angle: 30 degrees.
   e. Free Area: 11.5 sq ft (1.07 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Continuous line.
9. Basis of Design: Model AS1S42H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 0.465 inches (11.8 mm).
   b. Blade Profile: Non-Drainable blade.
   c. Blade Spacing: 0.775 inches (19.7 mm).
   d. Blade Angle: 42 degrees.
   e. Free Area: 9.68 sq ft (0.899 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Continuous line.
10. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and frames.
11. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.52 mm) for blades and 0.080 inch (2.03 mm) for frames.
12. Mullion Type: Exposed.
13. Mullion Type: Semi-recessed.
14. Mullion Type: Fully recessed.

B. Horizontal, Drainable-Blade Louver:
   1. Basis of Design: Model AS2D45H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 2 inches (50 mm).
      b. Blade Profile: Drainable blade with center baffle.
      c. Blade Spacing: 2.75 inches (70 mm).
      d. Blade Angle: 45 degrees.
      e. Free Area: 7.23 sq ft (0.67 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.12 inch wg (30 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 901 fpm (4.6 m per sec).
   2. Basis of Design: Model AS4D37H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 4 inches (100 mm).
      b. Blade Profile: Drainable blade.
      c. Blade Spacing: 3.5 inches (89 mm).
      d. Blade Angle: 37 degrees.
      e. Free Area: 9.07 sq ft (0.84 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.136 inch wg (34 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 868 fpm (4.4 m per sec).
      h. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
   3. Basis of Design: Model AS4DD45H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 4 inches (100 mm).
      b. Blade Profile: Drainable blade with center baffle.
      c. Blade Spacing: 4 inches (100 mm).
      d. Blade Angle: 45 degrees.
      e. Free Area: 8.37 sq ft (0.78 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.138 inch wg (34 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 942 fpm (4.8 m per sec).
      h. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
   4. Basis of Design: Model AS4D45H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 4 inches (100 mm).
      b. Blade Profile: Drainable blade with center baffle.
      c. Blade Spacing: 5 inches (127 mm).
      d. Blade Angle: 45 degrees.
      e. Free Area: 8.16 sq ft (0.76 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.19 inch wg (47 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 1021 fpm (5.2 m per sec).
      h. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
   5. Basis of Design: Model AS5D99H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 5 inches (127 mm).
      b. Blade Profile: Chevron.
      c. Blade Spacing: 2.25 inches (57 mm).
      d. Free Area: 7.73 sq ft (0.72 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      e. Pressure Drop: 0.208 inch wg (52 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.

f. Point of Beginning Water Penetration: 1141 fpm (5.8 m per sec).
g. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.

6. Basis of Design: Model AS6D37H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (150 mm).
   b. Blade Profile: Drainable blade with center baffle.
   c. Blade Spacing: 4.5 inches (114 mm).
   d. Blade Angle: 35 to 42 degrees.
   e. Free Area: 8.97 sq ft (0.83 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.12 inch wg (30 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: Minimum 1250 fpm (6.4 m per sec).
7. Basis of Design: Model AS6DD35H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (150 mm).
   b. Blade Profile: Drainable blade with center baffle.
   c. Blade Spacing: 4.5 inches (114 mm).
   d. Blade Angle: 35 to 42 degrees.
   e. Free Area: 8.91 sq ft (0.83 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.12 inch wg (30 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 993 fpm (5.04 m per sec).
   h. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
8. Basis of Design: Model AS4D37HP; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Drainable blade with center baffle.
   c. Blade Spacing: 3 inches (76 mm).
   d. Blade Angle: 35 degrees.
   e. Free Area: 9.63 sq ft (0.89 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.13 inch wg (32 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 909 fpm (4.6 m per sec).
   h. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
9. Basis of Design: Model AS6D37HP; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (152 mm).
   b. Blade Profile: Drainable blade.
   c. Blade Spacing: 4 inches (100 mm).
   d. Free Area: 10.06 sq ft (0.93 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   e. Pressure Drop: 0.13 inch wg (32 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   f. Point of Beginning Water Penetration: 1103 fpm (5.6 m per sec).
   g. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
10. Basis of Design: Model EA-22; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Dual Drainable blade with center baffle.
   c. Blade Spacing: 4 inches (100 mm).
   d. Blade Angle: 45 degrees.
   e. Free Area: 8.37 sq ft (0.78 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.15 inch wg (37 Pa) static pressure drop at 1000 fpm (5.1 m

per sec) free-area velocity.
g. Point of Beginning Water Penetration: 1075 fpm (5.5 m per sec).

11. Basis of Design: Model EA-64; as manufactured by Airline Louvers, a Mestek Company.
    a. Louver Depth: 6 inches (152 mm).
    b. Blade Profile: Drainable blade.
    c. Blade Spacing: 4 inches (100 mm).
    d. Blade Angle: 37.5 degrees.
    e. Free Area: 9.24 sq ft (0.86 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
    f. Pressure Drop: 0.14 inch wg (35 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
    g. Point of Beginning Water Penetration: Minimum 1250 fpm (6.4 m per sec).
12. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and frames.
13. Frame and Blade Nominal Thickness: Not less than 0.060 inch (1.52 mm) for blades and 0.080 inch (2.03 mm) for frames.
14. Mullion Type: Exposed.
15. Mullion Type: Semi-recessed.
16. Mullion Type: Fully recessed.
17. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

C. Horizontal, Continuous-Line, Drainable-Blade Louver:
1. Basis of Design: Model AS6DD45H; as manufactured by Airline Louvers, a Mestek Company.
2. Louver Depth: 6 inches (150 mm).
3. Blade Spacing: 5.375 inches (137 mm).
4. Blade Angle: 45 degrees.
5. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and frames.
6. Free Area: 8.4 sq ft (0.78 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
7. Pressure Drop: Not more than 0.14 inch wg (35 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
8. Point of Beginning Water Penetration: Not less than 1100 fpm (5.6 m per sec).
9. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.

D. Horizontal, Wind-Driven-Rain-Resistant Louver:
1. Basis of Design: Model AS2D99HS; as manufactured by Airline Louvers, a Mestek Company.
    a. Louver Depth: 2 inches (50 mm).
    b. Blade Profile: Chevron.
    c. Blade Spacing: 1 inches (25 mm).
    d. Free Area: 6.93 sq ft (0.64 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
    e. Pressure Drop: 0.38 inch wg (95 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
2. Basis of Design: Model AS4D99HS; as manufactured by Airline Louvers, a Mestek Company.
    a. Louver Depth: 4 inches (100 mm).
    b. Blade Profile: Chevron.
    c. Blade Spacing: 1.625 inches (41 mm).
    d. Free Area: 7.50 sq ft (0.70 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
    e. Pressure Drop: 0.26 inch wg (65 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
3. Basis of Design: Model AS5D99HS; as manufactured by Airline Louvers, a Mestek

Company.
a. Louver Depth: 5 inches (127 mm).
b. Blade Profile: Chevron.
c. Blade Spacing: 2 inches (52 mm).
d. Free Area: 7.08 sq ft (0.66 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
e. Pressure Drop: 0.32 inch wg (80 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
f. Point of Beginning Water Penetration: Minimum 1250 fpm (6.4 m per sec).

4. Basis of Design: Model AS6S37HS; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 6 inches (152 mm).
b. Blade Profile: Straight/Chevron.
c. Blade Spacing: 3.5 inches (89 mm).
d. Free Area: 7.07 sq ft (0.66 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
e. Pressure Drop: 0.16 inch wg (40 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
f. Continuous line.

5. Basis of Design: Model AS7D99HS; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 7 inches (178 mm).
b. Blade Profile: Chevron.
c. Blade Spacing: 2.25 inches (57 mm).
d. Free Area: 7.22 sq ft (0.67 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
e. Pressure Drop: 0.34 inch wg (85 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
f. Point of Beginning Water Penetration: 1187 fpm (6.0 m per sec).

6. Basis of Design: Model AS8D99HS; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 8 inches (203 mm).
b. Blade Profile: Chevron.
c. Blade Spacing: 2.25 inches (57 mm).
d. Free Area: 9.01 sq ft (0.84 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
e. Pressure Drop: 0.48 inch wg (120 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.

7. Basis of Design: Model EA-52; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 5 inches (127 mm).
b. Blade Profile: Chevron.
c. Blade Spacing: 2 inches (52 mm).
d. Free Area: 7.08 sq ft (0.66 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
e. Pressure Drop: 0.31 inch wg (76.8 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
f. Point of Beginning Water Penetration: Minimum 1250 fpm (6.4 m per sec).

8. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and frames.

9. Wind Driven Rain Performance:
a. Effectiveness: Not less than 99 percent.
b. Effectiveness: Not less than 95 percent.
c. Effectiveness: Not less than 80 percent.
d. Effectiveness: Not less than _____ percent.
e. Rainfall Rate and Wind Speed: 3 inches (75 mm) per hour and 29 mph (13 m per sec).

f. Rainfall Rate and Wind Speed: 8 inches (200 mm) per hour and 50 mph (22.4 m per sec).
g. Core-Area Intake Velocity: 300 fpm (1.5 m per sec).
h. Core-Area Intake Velocity: 400 fpm (2.0 m per sec).
i. Core-Area Intake Velocity: 500 fpm (2.5 m per sec).

10. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

E. Vertical, Wind-Driven-Rain-Resistant Louver:

1. Basis of Design: Model AS3D99VS; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 3 inches (76 mm).
   b. Blade Profile: Chevron.
   c. Blade Spacing: 0.8125 inches (21 mm).
   d. Free Area: 7.06 sq ft (0.66 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   e. Pressure Drop: 0.083 inch wg (21 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
2. Basis of Design: Model AS4D99VS; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Chevron.
   c. Blade Spacing: 1.625 inches (41 mm).
   d. Free Area: 7.58 sq ft (0.70 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   e. Pressure Drop: 0.26 inch wg (65 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
3. Basis of Design: Model AS6D99VS; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (150 mm).
   b. Blade Profile: Chevron.
   c. Blade Spacing: 1.625 inches (41 mm).
   d. Free Area: 8.51 sq ft (0.79 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   e. Pressure Drop: 0.103 inch wg (26 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   f. Point of Beginning Water Penetration: Minimum 1250 fpm (6.4 m per sec).
4. Basis of Design: Model AS8D99VS; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 8 inches (200 mm).
   b. Blade Profile: Chevron.
   c. Blade Spacing: 1.25 inches (32 mm).
   d. Free Area: 4.41 sq ft (0.41 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   e. Pressure Drop: 0.13 inch wg (32 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
5. Basis of Design: Model EAV-66; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (150 mm).
   b. Blade Profile: Chevron.
   c. Blade Spacing: 1.625 inches (41 mm).
   d. Free Area: 7.85 sq ft (0.73 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   e. Pressure Drop: 0.103 inch wg (26 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   f. Continuous line.
6. Basis of Design: Model EAV-81; as manufactured by Airline Louvers, a Mestek Company.

a. Louver Depth: 8 inches (200 mm).
b. Blade Profile: Chevron.
c. Blade Spacing: 1.25 inches (32 mm).
d. Free Area: 4.69 sq ft (0.44 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
e. Pressure Drop: 0.19 inch wg (47 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.

7. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and frames.
8. Wind Driven Rain Performance:
   a. Effectiveness: Not less than 99 percent.
   b. Rainfall Rate and Wind Speed: 3 inches (75 mm) per hour and 29 mph (13 m per sec).
   c. Rainfall Rate and Wind Speed: 8 inches (200 mm) per hour and 50 mph (22.4 m per sec).
   d. Core-Area Intake Velocity: 300 fpm (1.5 m per sec).
   e. Core-Area Intake Velocity: 400 fpm (2.0 m per sec).
   f. Core-Area Intake Velocity: 500 fpm (2.5 m per sec).
9. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

F. Horizontal, Sight-Proof, Drainable-Blade Louver:
1. Basis of Design: Model AS4Y99H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Inverted Y.
   c. Blade Spacing: 3 inches (76 mm).
   d. Free Area: 5.98 sq ft (0.56 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   e. Pressure Drop: 0.36 inch wg (90 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   f. Point of Beginning Water Penetration: 920 fpm (4.7 m per sec).
   g. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
2. Basis of Design: Model AS4V99H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Chevron.
   c. Blade Angle: 70 degrees
   d. Blade Spacing: 3 inches (76 mm).
   e. Free Area: 6.22 sq ft (0.58 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.50 inch wg (125 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 789 fpm (4.0 m per sec).
3. Basis of Design: Model AS2Y99H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 2 inches (50 mm).
   b. Blade Profile: Inverted Y.
   c. Blade Spacing: 1.75 inches (44 mm).
   d. Free Area: 4.43 sq ft (0.41 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   e. Pressure Drop: 0.40 inch wg (100 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   f. Point of Beginning Water Penetration: 924 fpm (4.7 m per sec).
   g. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
4. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and frames.
5. Mullion Type: Exposed.

G. Vertical, Sight-Proof, Drainable-Blade Louver:
1. Basis of Design: Model AS4V99V; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 4 inches (100 mm).
b. Blade Profile: Chevron.
c. Blade Angle: 70 degrees.
d. Blade Spacing: 3 inches (76 mm).
e. Free Area: 6.22 sq ft (0.58 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
f. Pressure Drop: 0.50 inch wg (125 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
g. Point of Beginning Water Penetration: 848 fpm (4.3 m per sec).
h. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
2. Basis of Design: Model AS4Y99V; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 4 inches (100 mm).
b. Blade Profile: Inverted Y.
c. Blade Spacing: 3 inches (76 mm).
d. Free Area: 5.98 sq ft (0.56 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
e. Pressure Drop: 0.35 inch wg (87 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
f. Point of Beginning Water Penetration: 984 fpm (5.0 m per sec).
g. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and frames.
4. Mullion Type: Exposed.

2.4 FIXED, FORMED-METAL LOUVERS

A. Horizontal, Non-Drainable-Blade Louver:
1. Basis of Design: Model GS2S45H; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 2 inches (50 mm).
b. Blade Profile: Non-Drainable blade.
c. Blade Spacing: 2.125 inches (54 mm).
d. Blade Angle: 45 degrees.
2. Basis of Design: Model GS4S45H; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 4 inches (100 mm).
b. Blade Profile: Non-Drainable blade.
c. Blade Spacing: 4.125 inches (105 mm).
d. Blade Angle: 45 degrees.
e. Free Area: 8.11 sq ft (0.75 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
f. Pressure Drop: 0.185 inch wg (46 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
g. Point of Beginning Water Penetration: 614 fpm (3.1 m per sec).
3. Basis of Design: Model GS6S45H; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 6 inches (150 mm).
b. Blade Profile: Non-Drainable blade.
c. Blade Spacing: 6.5625 inches (167 mm).
d. Blade Angle: 45 degrees.
e. Free Area: 7.41 sq ft (0.69 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
f. Continuous line.

4. Frame and Blade Material and Nominal Thickness: Galvanized-steel, not less than 0.052 inch (1.32 mm).
5. Frame and Blade Material and Nominal Thickness: Galvanized-steel, not less than 0.064 inch (1.63 mm).
6. Frame and Blade Material and Nominal Thickness: Stainless-steel, not less than 0.050 inch (1.27 mm).
7. Frame and Blade Material and Nominal Thickness: Stainless-steel, not less than 0.062 inch (1.59 mm).
8. Mullion Type: Exposed.

B. Horizontal, Drainable-Blade Louver:
1. Basis of Design: Model GS4D45H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Non-Drainable blade.
   c. Blade Spacing: 4 inches (100 mm).
   d. Blade Angle: 45 degrees.
   e. Free Area: 8.00 sq ft (0.74 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.14 inch wg (35 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 987 fpm (5.0 m per sec).
2. Basis of Design: Model GS6D45H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (150 mm).
   b. Blade Profile: Non-Drainable blade.
   c. Blade Spacing: 6 inches (150 mm).
   d. Blade Angle: 45 degrees.
   e. Free Area: 8.31 sq ft (0.77 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.14 inch wg (35 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 952 fpm (4.8 m per sec).
   h. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
3. Basis of Design: Model GS6D35H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (150 mm).
   b. Blade Profile: Non-Drainable blade.
   c. Blade Spacing: 3.5 inches (89 mm).
   d. Blade Angle: 35 degrees.
   e. Free Area: 8.84 sq ft (0.82 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.138 inch wg (34 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 1096 fpm (5.6 m per sec).
   h. Continuous line. Visible mullion required every 10 feet (3048 mm) maximum.
4. Frame and Blade Material and Nominal Thickness: Galvanized-steel, not less than 0.052 inch (1.32 mm) for frames and 0.040 inch (1.02 mm) for blades.
5. Frame and Blade Material and Nominal Thickness: Galvanized-steel, not less than 0.052 inch (1.32 mm).
6. Frame and Blade Material and Nominal Thickness: Galvanized-steel, not less than 0.064 inch (1.63 mm).
7. Frame and Blade Material and Nominal Thickness: Stainless-steel, not less than 0.050 inch (1.27 mm).
8. Frame and Blade Material and Nominal Thickness: Stainless-steel, not less than 0.062 inch (1.59 mm).
9. Mullion Type: Exposed.

10. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 FIXED, ACOUSTICAL LOUVERS

A. Acoustic Performance: Provide acoustical louvers complying with ratings specified, as demonstrated by testing manufacturer's stock units identical to those specified except for length and width:
   1. Airborne sound-transmission loss according to ASTM E 90.
   2. Outdoor-indoor, sound-transmission loss according to ASTM E 966.

B. Fixed, Formed-Metal Acoustical Louver: Louver with formed-metal blades filled on interior with mineral-fiber, rigid-board, acoustical insulation retained by perforated metal sheet of same material and finish as blade.
   1. Basis of Design: Model AS12AC45H/GS12AC45H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 12 inches (300 mm).
      b. Blade Profile: Non-Drainable blade.
      c. Blade Spacing: 12 inches (300 mm).
      d. Blade Angle: 35 degrees.
      e. Free Area: 4.03 sq ft (0.38 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.138 inch wg (34 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 1057 fpm (5.4 m per sec).
      h. Continuous line.
   2. Basis of Design: Model AS126AC45H/GS126AC45H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 12 inches (300 mm).
      b. Blade Profile: Acoustical.
      c. Blade Spacing: 6 inches (150 mm).
      d. Blade Angle: 42 degrees.
      e. Free Area: 3.98 sq ft (0.37 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.07 inch wg (17 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 1084 fpm (5.5 m per sec).
      h. Continuous line.
   3. Basis of Design: Model AS66AC45H/GS66AC45H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 6 inches (150 mm).
      b. Blade Profile: Acoustical.
      c. Blade Spacing: 6 inches (150 mm).
      d. Blade Angle: 45 degrees.
      e. Free Area: 4.23 sq ft (0.39 sq m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.10 inch wg (25 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 858 fpm (4.4 m per sec).
      h. Continuous line.
   4. Basis of Design: Model AS88AC45H/GS88AC45H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 8 inches (200 mm).
      b. Blade Profile: Acoustical.
      c. Blade Spacing: 8 inches (200 mm).
      d. Blade Angle: 45 degrees.
      e. Free Area: 4.03 sq ft (0.67 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.

f. Pressure Drop: 0.085 inch wg (21 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
g. Point of Beginning Water Penetration: 990 fpm (5.0 m per sec).
h. Continuous line.

5. Basis of Design: Model GC7ID35H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 7 inches (178 mm).
   b. Blade Profile: Acoustical.
   c. Blade Spacing: 3 inches (76 mm).
   d. Blade Angle: 35 degrees, adjustable.
   e. Free Area: 7.26 sq ft (0.67 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.17 inch wg (42 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 841 fpm (4.3 m per sec).
   h. Continuous line.
6. Basis of Design: Model GS4AC45H/GS4AC45L; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 4 inches (100 mm).
   b. Blade Profile: Acoustical.
   c. Blade Spacing: 7.5 inches (190 mm).
   d. Blade Angle: 40 degrees.
   e. Free Area: 4.51 sq ft (0.42 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.18 inch wg (45 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 787 fpm (4.0 m per sec).
   h. Continuous line.
7. Frame Material: Extruded aluminum or aluminum sheet, not less than 0.080 inch (2.03 mm).
8. Frame Material: Galvanized-steel, not less than 0.052 inch (1.32 mm).
9. Frame Material: Galvanized-steel, not less than 0.064 inch (1.63 mm).
10. Blade Material: Aluminum sheet, not less than 0.063 inch (1.60 mm).
11. Blade Material: Aluminum sheet, not less than 0.080 inch (2.03 mm).
12. Blade Material: Galvanized-steel sheet, not less than 0.034 inch (0.86 mm).
13. Blade Material: Galvanized-steel sheet, not less than 0.040 inch (1.02 mm).
14. Blade Material: Galvanized-steel sheet, not less than 0.052 inch (1.32 mm).
15. Airborne Sound-Transmission Loss: STC 10 per ASTM E 413, determined by testing in accordance with ASTM E 90.
16. Airborne Sound-Transmission Loss: _____ per ASTM E 413, determined by testing in accordance with ASTM E 90.
17. Outdoor-Indoor, Sound Transmission Loss: OITC 10 per ASTM E 1332, determined by testing in accordance with ASTM E 966.
18. Outdoor-Indoor, Sound Transmission Loss: _____ per ASTM E 1332, determined by testing in accordance with ASTM E 966.

2.6 OPERABLE, EXTRUDED-ALUMINUM LOUVERS

A. Louver Construction and Operation: Provide operable louvers with extruded-aluminum frames and blades not less than 0.080-inch (2.03-mm) nominal thickness, and with operating mechanisms to suit louver sizes.
   1. Operation: Hand operation with push bars.
   2. Operation: Crank operation with removable-crank operator in sill or jamb.
   3. Operation: Chain operation with tension spring, wall clip, pull chain, and 160 degrees F (71 degrees C) fusible link.
   4. Operation: Motor operation with two-position, spring-return application (with power on, motor opens louver; with power off, spring closes louver); 24-V to 230-V, 60-Hz motor

and limit switch.
a. Frame-mounted switch.
b. Remote-mounted switch with indicator light.
c. Terminals for controlling devices.

5. Operation: Motor operation with two-direction, 24-V to 230-V, 60-Hz motor and limit switches.
a. Frame-mounted switch.
b. Remote-mounted switch with indicator light.
c. Terminals for controlling devices.

6. Operation: Pneumatic piston operation for use with 80- to 100-psi (550- to 690-kPa) compressed air operation; power open, power close.
a. Operation: Two-position.
b. Operation: Modulating.
c. Include spring-return fail-safe.

B. Single-Blade, Operable Louver:

1. Basis of Design: Model AA4S35H; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 4 inches (100 mm).
b. Blade Profile: Pin-Lock.
c. Blade Spacing: 4 inches (100 mm).
d. Blade Angle: Adjustable.
e. Free Area: 6.84 sq ft (0.64 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
f. Pressure Drop: 0.16 inch wg (40 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
g. Point of Beginning Water Penetration: 1044 fpm (5.3 m per sec).

2. Basis of Design: Model AA6S90H; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 6 inches (150 mm).
b. Blade Profile: Pin-Lock.
c. Blade Spacing: 4 inches (100 mm).
d. Blade Angle: Adjustable.
e. Free Area: 10.71 sq ft (0.99 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
f. Pressure Drop: 0.14 inch wg (35 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
g. Point of Beginning Water Penetration: 681 fpm (3.5 m per sec).

3. Basis of Design: Model AA4D45H; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 4 inches (100 mm).
b. Blade Profile: Pin-Lock.
c. Blade Spacing: 4 inches (100 mm).
d. Blade Angle: Adjustable.
e. Free Area: 7.07 sq ft (0.66 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
f. Pressure Drop: 0.14 inch wg (35 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
g. Point of Beginning Water Penetration: 974 fpm (4.9 m per sec).

4. Basis of Design: Model AA6S45H; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 6 inches (150 mm).
b. Blade Profile: Non-Drainable blade with center baffle.
c. Blade Spacing: 4.5 inches (114 mm).
d. Blade Angle: Adjustable.
e. Free Area: 9.06 sq ft (0.84 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.

f. Pressure Drop: 0.15 inch wg (37 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
g. Point of Beginning Water Penetration: 841 fpm (4.3 m per sec).

5. Basis of Design: Model AA6D45H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (150 mm).
   b. Blade Profile: Non-Drainable blade with center baffle.
   c. Blade Spacing: 4.5 inches (114 mm).
   d. Blade Angle: Adjustable.
   e. Free Area: 8.58 sq ft (0.80 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.145 inch wg (36 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 880 fpm (4.5 m per sec).
6. Provide vinyl blade-edge gaskets for each louver blade.
7. Provide stainless steel jamb seals.
8. Provide stainless steel jamb seals or vinyl blade-edge gaskets for each louver blade.
9. Air Leakage: Not more than 3.5 cfm per secq ft (17.8 L/s per sq m) of louver gross area at a differential static pressure of 0.15 inch wg (37 Pa) with operable louver blades closed.
10. Air Leakage: Not more than _____ of louver gross area at a differential static pressure of 0.15 inch wg (37 Pa) with operable louver blades closed.
11. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

C. Dual-Blade, Operable Louver: Fixed drainable blades and operable Non-Drainable blades combined in a single frame.
   1. Basis of Design: Model AC4D35H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 4 inches (100 mm).
      b. Blade Profile: Drainable.
      c. Blade Spacing: 3.5 inches (89 mm).
      d. Blade Angle: 35 degrees, adjustable.
      e. Free Area: 8.36 sq ft (0.78 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.14 inch wg (35 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 994 fpm (5.0 m per sec).
   2. Basis of Design: Model AC6D35H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 6 inches (150 mm).
      b. Blade Profile: Drainable.
      c. Blade Spacing: 4.5 inches (114 mm).
      d. Blade Angle: 35 degrees, adjustable.
      e. Free Area: 8.24 sq ft (0.77 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.11 inch wg (27 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 1029 fpm (5.2 m per sec).
   3. Basis of Design: Model AC6D35HAF; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 6 inches (150 mm).
      b. Blade Profile: Straight.
      c. Blade Spacing: 4.5 inches (114 mm).
      d. Blade Angle: 35 degrees, adjustable.
      e. Free Area: 8.24 sq ft (0.77 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.13 inch wg (32 Pa) static pressure drop at 1000 fpm (5.1 m

per sec) free-area velocity.
g. Point of Beginning Water Penetration: 1029 fpm (5.2 m per sec).

4. Basis of Design: Model AC6S35H; as manufactured by Airline Louvers, a Mestek Company.
   a. Louver Depth: 6 inches (150 mm).
   b. Blade Profile: Straight.
   c. Blade Spacing: 4.5 inches (114 mm).
   d. Blade Angle: 35 degrees, adjustable.
   e. Free Area: 8.38 sq ft (0.78 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
   f. Pressure Drop: 0.18 inch wg (45 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
   g. Point of Beginning Water Penetration: 981 fpm (4.8 m per sec).
5. Air Leakage: Not more than 1.5 cfm per sq ft (7.6 L/s per sq m) of louver gross area at a differential static pressure of 0.15 inch wg (37 Pa) with operable louver blades closed.
6. Air Leakage: Not more than _____ of louver gross area at a differential static pressure of 0.15 inch wg (37 Pa) with operable louver blades closed.
7. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.7 OPERABLE, FORMED-METAL LOUVERS

A. Louver Operation: Provide operable louvers with operating mechanisms to suit louver sizes.
   1. Operation: Hand operation with push bars.
   2. Operation: Crank operation with removable-crank operator in sill or jamb.
   3. Operation: Chain operation with tension spring, wall clip, pull chain, and 160 degrees F (71 degrees C) fusible link.
   4. Operation: Motor operation with two-position, spring-return application (with power on, motor opens louver; with power off, spring closes louver); 24-V to 230-V, 60-Hz motor and limit switch.
      a. Frame-mounted switch.
      b. Remote-mounted switch with indicator light.
      c. Terminals for controlling devices.
   5. Operation: Motor operation with two-direction, 24-V to 230-V, 60-Hz motor and limit switches.
      a. Frame-mounted switch.
      b. Remote-mounted switch with indicator light.
      c. Terminals for controlling devices.
   6. Operation: Pneumatic piston operation for use with 80- to 100-psi (550- to 690-kPa) compressed air operation; power open, power close.
      a. Operation: Two-position.
      b. Operation: Modulating.
      c. Include spring-return fail-safe.

B. Single-Blade, Operable Louver:
   1. Basis of Design: Model GA6D45H; as manufactured by Airline Louvers, a Mestek Company.
      a. Louver Depth: 6 inches (150 mm).
      b. Blade Profile: Straight.
      c. Blade Spacing: 3.5 inches (89 mm).
      d. Blade Angle: 45 degrees, adjustable.
      e. Free Area: 8.50 sq ft (0.79 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
      f. Pressure Drop: 0.108 inch wg (27 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
      g. Point of Beginning Water Penetration: 859 fpm (4.4 m per sec).
   2. Basis of Design: Model GA4S45H; as manufactured by Airline Louvers, a Mestek

Company.
a. Louver Depth: 4 inches (100 mm).
b. Blade Profile: Straight.
c. Blade Spacing: 4.375 inches (111 mm).
d. Blade Angle: 45 degrees.
e. Free Area: 7.79 sq ft (0.72 sq.m) for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
f. Pressure Drop: 0.20 inch wg (50 Pa) static pressure drop at 1000 fpm (5.1 m per sec) free-area velocity.
g. Point of Beginning Water Penetration: 645 fpm (3.3 m per sec).
3. Provide vinyl blade-edge gaskets for each louver blade.
4. Provide stainless steel jamb seals.
5. Provide stainless steel jamb seals or vinyl blade-edge gaskets for each louver blade.
6. Air Leakage: Not more than 3.5 cfm per secq ft (17.8 L/s per sq m) of louver gross area at a differential static pressure of 0.15 inch wg (37 Pa) with operable louver blades closed.
7. Air Leakage: Not more than _____ of louver gross area at a differential static pressure of 0.15 inch wg (37 Pa) with operable louver blades closed.
8. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

C. Dual-Blade, Operable Louver: Fixed drainable blades and operable Non-Drainable blades combined in a single frame.
1. Basis of Design: Model GC6D35H; as manufactured by Airline Louvers, a Mestek Company.
a. Louver Depth: 7 inches (150 mm).
b. Blade Profile: Straight.
c. Blade Spacing: 3 inches (76 mm).
d. Blade Angle: 35 degrees, adjustable.
2. Frame and Blade Material and Nominal Thickness: Galvanized steel sheet, not less than 0.052 inch (1.32 mm) for frames and 0.040 inch (1.02 mm) for blades.
3. Frame and Blade Material and Nominal Thickness: Galvanized steel sheet, not less than 0.052 inch (1.32 mm).
4. Frame and Blade Material and Nominal Thickness: Galvanized steel sheet, not less than 0.064 inch (1.63 mm).
5. Frame and Blade Material and Nominal Thickness: Stainless steel sheet, not less than 0.050 inch (1.27 mm).
6. Frame and Blade Material and Nominal Thickness: Stainless steel sheet, not less than 0.062 inch (1.59 mm).
7. Free Area: Not less than _____ for a 48 inch (1220 mm) wide by 48 inch (1220 mm) high louver.
8. Pressure Drop: Not more than _____ static pressure drop at _____ free-area velocity.
9. Point of Beginning Water Penetration: Not less than _____.
10. Air Leakage: Not more than 1.5 cfm per sq ft (7.6 L/s per sq m) of louver gross area at a differential static pressure of 0.15 inch wg (37 Pa) with operable louver blades closed.
11. Air Leakage: Not more than _____ of louver gross area at a differential static pressure of 0.15 inch wg (37 Pa) with operable louver blades closed.
12. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.8 OPERABLE, INSULATED LOUVERS

A. Louver Operation: Provide operable louvers with operating mechanisms to suit louver sizes.
1. Operation: Hand operation with push bars.
2. Operation: Crank operation with removable-crank operator in sill or jamb.
3. Operation: Chain operation with tension spring, wall clip, pull chain, and 160 degrees F (71 degrees C) fusible link.
4. Operation: Motor operation with two-position, spring-return application (with power on,

motor opens louver; with power off, spring closes louver); 24-V to 230-V, 60-Hz motor and limit switch.
    a. Frame-mounted switch.
    b. Remote-mounted switch with indicator light.
    c. Terminals for controlling devices.
5. Operation: Motor operation with two-direction, 24-V to 230-V, 60-Hz motor and limit switches.
    a. Frame-mounted switch.
    b. Remote-mounted switch with indicator light.
    c. Terminals for controlling devices.
6. Operation: Pneumatic piston operation for use with 80- to 100-psi (550- to 690-kPa) compressed air operation; power open, power close.
    a. Operation: Two-position.
    b. Operation: Modulating.
    c. Include spring-return fail-safe.

B. Operable, Insulated, Extruded-Aluminum Louver: Single-blade, operable louver with gasketed, insulated blades. Frames and blade frames have urethane thermal break.
1. Frames: Extruded aluminum, not less than 0.080 inch (2.03 mm) nominal thickness.
2. Blade facings: Sheet aluminum, not less than 0.032 inch (0.81 mm) nominal thickness.
3. Louver Depth: 6 inches (150 mm).
4. Louver Depth: 9 inches (225 mm).
5. Insulation: Extruded polystyrene foam, 2 inches (50 mm) thick.
6. Insulation: Foamed-in-place polyurethane.

C. Operable, Insulated, Formed-Metal Louver: Single-blade, operable louver with gasketed, insulated blades.
1. Louver Depth: 6 inches (150 mm).
2. Louver Depth: 8 inches (200mm).
3. Frames: Galvanized steel sheet, not less than 0.052 inch (1.32 mm) nominal thickness.
4. Frames: Galvanized steel sheet, not less than 0.064 inch (1.63 mm) nominal thickness.
5. Frames: Stainless steel sheet, not less than 0.050 inch (1.27 mm) nominal thickness.
6. Frames: Stainless steel sheet, not less than 0.062 inch (1.59 mm) nominal thickness.
7. Blade facings: Galvanized steel sheet, not less than 0.028 inch (0.71 mm) nominal thickness.
8. Blade facings: Galvanized steel sheet, not less than 0.040 inch (1.02 mm) nominal thickness.
9. Blade facings: Galvanized steel sheet, not less than 0.052 inch (1.32 mm) nominal thickness.
10. Blade facings: Galvanized steel sheet, not less than 0.064 inch (1.63 mm) nominal thickness.
11. Blade facings: Stainless steel sheet, not less than 0.025 inch (0.64 mm) nominal thickness.
12. Blade facings: Stainless steel sheet, not less than 0.038 inch (0.95 mm) nominal thickness.
13. Blade facings: Stainless steel sheet, not less than 0.050 inch (1.27 mm) nominal thickness.
14. Blade facings: Stainless steel sheet, not less than 0.062 inch (1.59 mm) nominal thickness.
15. Insulation: Extruded polystyrene foam, 1 inch (25 mm) thick.
16. Insulation: Rigid, glass-fiber board insulation, 1 inch (25 mm) thick.
17. Insulation: Foamed-in-place polyurethane, 1/2 inch (13 mm) thick.
18. Insulation: _____.

2.9 LOUVER SCREENS

A. General:
1. Locations: Provide screen at each exterior louver.
2. Locations: Provide screen at louvers indicated.
3. Screen Location for Fixed Louvers: Interior face.
4. Screen Location for Operable Louvers: Interior face unless otherwise indicated.
5. Screen Location for Operable Louvers: Exterior face unless otherwise indicated.
6. Screening Type: Bird screening.
7. Screening Type: Bird screening except where insect screening is indicated.
8. Screening Type: Insect screening.
9. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and 12 inches (300 mm) on center.
10. Secure screen frames to louver frames with machine screws with heads finished to match louver, spaced a maximum of 6 inches (150 mm) from each corner and 12 inches (300 mm) on center.
11. Louver Screen Frames: Fabricate with notched and cinched corners to louver sizes indicated.
    a. Metal: Same type and form of metal as indicated for louver to which screens are attached.
    b. Finish: Same finish as louver frames to which louver screens are attached.
    c. Finish: Mill finish unless otherwise indicated.
    d. Screen Frame Type: Rewirable frames with a driven spline or insert.
    e. Screen Frame Type: Non-rewirable, U-shaped frames.

B. Louver Screening for Aluminum Louvers:
1. Bird Screening: Aluminum, 1/2 inch (13 mm) square mesh, 0.063 inch (1.60 mm) wire.
2. Bird Screening: Stainless steel, 1/2 inch (13 mm) square mesh, 0.047 inch (1.19 mm) wire.
3. Bird Screening: Flattened, expanded aluminum, 3/4 by 0.050 inch (19 by 1.27 mm) thick.
4. Insect Screening: Aluminum, 18 by 16 (1.4 by 1.6 mm) mesh, 0.012 inch (0.30 mm) wire.
5. Insect Screening: Stainless steel, 18 by 18 (1.4 by 1.4 mm) mesh, 0.009 inch (0.23 mm) wire.

C. Louver Screening for Galvanized-Steel Louvers:
1. Bird Screening: Galvanized steel, 1/2 inch (13 mm) square mesh, 0.041 inch (1.04 mm) wire.
2. Bird Screening: Stainless steel, 1/2 inch (13 mm) square mesh, 0.047 inch (1.19 mm) wire.
3. Insect Screening: Aluminum, 18 by 14 (1.4 by 1.8 mm) mesh, 0.011 inch (0.28 mm) wire.
4. Insect Screening: Stainless steel, 18 by 18 (1.4 by 1.4 mm) mesh, 0.009 inch (0.23 mm) wire.

D. Louver Screening for Stainless-Steel Louvers:
1. Bird Screening: Stainless steel, 1/2 inch (13 mm) square mesh, 0.047 inch (1.19 mm) wire.
2. Insect Screening: Stainless steel, 18 by 18 (1.4 by 1.4 mm) mesh, 0.009 inch (0.23 mm) wire.

2.10 BLANK-OFF PANELS

A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.
1. Material: Aluminum sheet for aluminum louvers, not less than 0.050 inch (1.2 mm) nominal thickness.
2. Material: Galvanized-steel sheet for galvanized-steel louvers, not less than 0.040 inch

(1.02 mm) nominal thickness.
3. Material: Galvanized-steel sheet for galvanized-steel louvers, not less than 0.052 inch (1.32 mm) nominal thickness.
4. Material: Stainless-steel sheet for stainless-steel louvers, not less than 0.038 inch (0.95 mm) nominal thickness.
5. Material: Stainless-steel sheet for stainless-steel louvers, not less than 0.050 inch (1.27 mm) nominal thickness.
6. Panel Finish: Same finish applied to louvers.
7. Panel Finish: Same finish type applied to louvers, but black color.
8. Attachment: Attach blank-off panels with clips.
9. Attachment: Attach blank-off panels with sheet metal screws.
10. Attachment: Attach blank-off panels with _____.

B. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
1. Thickness: 1 inch (25 mm).
2. Thickness: 2 inches (50 mm).
3. Thickness: 4 inches (100 mm).
4. Metal Facing Sheets: Aluminum sheet, not less than 0.032 inch (0.81 mm) nominal thickness.
5. Metal Facing Sheets: Galvanized-steel sheet, not less than 0.028 inch (0.71 mm) nominal thickness.
6. Metal Facing Sheets: Stainless-steel sheet, not less than 0.031 inch (0.79 mm) nominal thickness.
7. Insulating Core: Rigid, glass-fiber insulation.
8. Insulating Core: Two-part polyurethane foam.
9. Insulating Core: Rigid, glass-fiber insulation or two-part polyurethane foam.
10. Insulating Core: _____.
11. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded aluminum channel frames, not less than 0.080 inch (2.03 mm) nominal thickness, with corners mitered and with same finish as panels.
12. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard channel frames, with corners mitered and with same finish as panels.
13. Edge Treatment: _____.
14. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
15. Panel Finish: Same finish applied to louvers.
16. Panel Finish: Same finish type applied to louvers, but black color.
17. Attachment: Attach blank-off panels with clips.
18. Attachment: Attach blank-off panels with sheet metal screws.
19. Attachment: Attach blank-off panels with _____.

2.11 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Galvanized Sheet Steel: ASTM A 653/A 653M, G60 (Z180) zinc coating, mill phosphatized.

D. Galvanized Sheet Steel: ASTM A 653/A 653M, G90 (Z275) zinc coating, mill phosphatized.

E. Stainless Steel Sheet: ASTM A 240/ASTM 240M, Type 304, No. 2B finish.

F. Stainless Steel Sheet: ASTM A 240/ASTM 240M, Type 304, No. 2D finish.

G. Stainless Steel Sheet: ASTM A 240/ASTM 240M, Type 304, No. 4 finish, with grain running parallel to length of blades and frame members.

H. Stainless Steel Sheet: ASTM A 240/ASTM 240M, Type 304, No. 4 finish, with grain running perpendicular to length of blades and frame members.

I. Stainless Steel Sheet: ASTM A 240/ASTM 240M, Type 304, No. 4 finish, with grain running perpendicular to length of blades and parallel to length frame members.

J. Stainless Steel Sheet: ASTM A 240/ASTM 240M, Type 304, No. 6 finish.

K. Fasteners: Use types and sizes to suit unit installation conditions.
1. Use hex-head screws for exposed fasteners unless otherwise indicated.
2. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
3. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
4. For fastening galvanized steel, use hot-dip galvanized steel or 300 series stainless-steel fasteners.
5. For fastening stainless steel, use 300 series stainless-steel fasteners.
6. For color-finished louvers, use fasteners with heads that match color of louvers.

L. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

M. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.12 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated.
2. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern where indicated.
3. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.
4. Horizontal Mullions: Provide horizontal mullions at joints where indicated.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Maintain equal louver blade spacing to produce uniform appearance.

E. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
1. Frame Type: Channel, unless otherwise indicated.
2. Frame Type: Exterior flange, unless otherwise indicated.
3. Frame Type: Interior flange, unless otherwise indicated.

F. Include supports, anchorages, and accessories required for complete assembly.

G. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 60 inches (1524 mm) o.c., whichever is less.
1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind

louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.

2. Continuous Line Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
3. Exterior Corners: Prefabricated corner units.
    a. Blades: Mitered and welded.
    b. Mullions at Corners with a formed cover plate.

H. Provide subsills made of same material as louvers for recessed louvers.

I. Provide subsills made of same material as louvers or extended sills for recessed louvers.

J. Provide extended sills for recessed louvers.

K. Join frame members to each other and to fixed louver blades with filet welds unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary:
    1. Welds concealed from view.
    2. Threaded fasteners may be used, as standard with louver manufacturer.

2.13 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

C. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

D. Color Anodic Finish:
    1. Thickness: AA-M12C22A42/A44, Class I, 0.018 mm.
    2. Thickness: AA-M12C22A32/A34, Class II, 0.010 mm.
    3. Color: Champagne.
    4. Color: Light bronze.
    5. Color: Medium bronze.
    6. Color: Dark bronze.
    7. Color: Black.

E. Conversion-Coated Finish: AA-C12C42 (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating).

F. Conversion-Coated and Factory-Primed Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below).
    1. Primer: Organic Coating: Air-dried primer of not less than 2-mil (0.05-mm) dry film thickness.
    2. Primer: _____.

G. Baked-Enamel or Powder-Coat Finish: AAMA 2604 except with a minimum dry film thickness of 2.4 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
    1. Color and Gloss: As indicated by manufacturer's designations.
    2. Color and Gloss: Match Architect's sample.
    3. Color and Gloss: As selected by Architect from manufacturer's full range.
    4. Color and Gloss: _____.

H. High-Performance Organic Finish: Two-coat fluoropolymer finish. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers'

written instructions.
1. AAMA 2604 compliant.
2. AAMA 2605 compliant.
3. Containing not less than 50 percent PVDF resin by weight in color coat.
4. Containing not less than 70 percent PVDF resin by weight in color coat.
5. Color and Gloss: As indicated by manufacturer's designations.
6. Color and Gloss: Match Architect's sample.
7. Color and Gloss: As selected by Architect from manufacturer's full range.
8. Color and Gloss: _____.

I. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
1. Containing not less than 50 percent PVDF resin by weight in color coat.
2. Containing not less than 70 percent PVDF resin by weight in color coat.
3. Color and Gloss: As indicated by manufacturer's designations.
4. Color and Gloss: Match Architect's sample.
5. Color and Gloss: As selected by Architect from manufacturer's full range.
6. Color and Gloss: _____.

2.14 GALVANIZED STEEL SHEET FINISHES

A. Finish louvers after assembly.

B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair according to ASTM A 780.

C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 2 mils (0.05 mm).
1. Color and Gloss: As indicated by manufacturer's designations.
2. Color and Gloss: Match Architect's sample.
3. Color and Gloss: As selected by Architect from manufacturer's full range.
4. Color and Gloss: _____.

2.15 STAINLESS STEEL SHEET FINISHES

A. Repair sheet finish by grinding and polishing irregularities, weld spatter, scratches, and forming marks to match surrounding finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.

B. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

C. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

D. Form closely fitted joints with exposed connections accurately located and secured.

E. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

F. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required.

3.4 ADJUSTING

A. Test operable louvers and adjust as needed to produce fully functioning units that comply with requirements.

3.5 CLEANING AND PROTECTION

A. Clean products in accordance with the manufacturers recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 9 - FINISHES

SECTION 09 24 00

CEMENT PLASTERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior portland cement plasterwork on unit masonry.
2. Exterior portland cement plasterwork on unit masonry.

1.3 ACTION SUBMITTALS

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

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.5 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F (4.4 deg C) for at least 48 hours before plaster application, and continuously during and after application.

1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

C. Exterior Plasterwork:

1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C).

D. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Bonding Compound: ASTM C 932.

2.2 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, Type I

B. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

C. Sand Aggregate: ASTM C 897.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Bonding Compound: Apply on unit masonry and concrete plaster bases.

3.4 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.5 PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00

SECTION 09 30 00
TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glazed Wall Tile.
B. Ceramic Mosaic Tile.
C. Paver Tile.
D. Quarry Tile.
E. Glass Mosaic Tile.
F. Glass Tile.
G. Waterproofing.
H. Crack Isolation.
I. Stone thresholds.
J. Ceramic accessories.
K. Ceramic trim.
L. Non-ceramic trim.

1.2 RELATED SECTIONS

A. Section 03 35 05 - Self-Leveling Underlayment.

B. Section 07 92 00 - Joint Sealant.

1.3 REFERENCES

A. ANSI A108.1A, 1999 - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.

B. ANSI A108.1B, 1999 - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.

C. ANSI A108.1C, 1999 - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.

D. ANSI A108.4, 1999 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.

E. ANSI A108.5, 1999 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.

F. ANSI A108.6, 1999 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.

G. ANSI A108.8, 1999 - Specifications for Ceramic Tile Installed with Chemical-Resistant Furan Mortar and Grout.

H. ANSI A108.9, 1999 - Specifications for Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.

I. ANSI A108.10, 1999 - Specifications for Installation of Grout in Tilework.

J. ANSI A118.1, 1999 - Standard Specification for Dry-Set Portland Cement Mortar.

K. ANSI A118.3, 1999 - Chemical-Resistant, Water-Cleanable, Tile-Setting and - Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.

L. ANSI A118.4, 1999 - Latex-Portland Cement Mortar.

M. ANSI A118.5, 1999 - Chemical-Resistant Furan Mortar and Grout.

N. ANSI A118.6, 1999 - Standard Ceramic Tile Grouts.

O. ANSI A118.7, 1999 - Polymer Modified Cement Grouts

P. ANSI A118.8, 1999 - Modified Epoxy Emulsion Mortar/Grout.

Q. ANSI A118.9, 1999 - Test Methods and Specifications for Cementitious Backer Units

R. ANSI A118.10, 1999 - Load bearing, Bonded, Waterproof Membranes for Thinset Ceramic Tile and Dimensional Stone.

S. ANSI A118.11, 1999 - Exterior Grade Plywood (EGP) Latex-Portland Cement Mortar.

T. ANSI A136.1, 1999 - Organic Adhesives for Installation of Ceramic Tile.

U. ANSI A137.1, 1988 - Specifications for Ceramic Tile.

V. ASTM C50 - Standard Specification for Portland Cement.

W. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

X. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

Y. ASTM C241 - Test Method For Abrasion Resistance of Stone Subjected to Foot Traffic.

Z. ASMT C503 - Specification for Marble Building Stone (Exterior).

AA. ASTM C615 - Specification for Granite Dimension Stone.

BB. ASTM C629 - Specification for Slate Dimension Stone.

CC. ASTM C847 - Standard Specification for Metal Lath.

DD. ASTM C1028 - Test method for Determining the Static Coefficient of Friction or Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull meter Method.

EE. ASTM D4397 - Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.

FF. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of America, Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the

following values as determined by testing in conformance with ASTM C 1028.
1. Level Surfaces: Minimum of 0.6 (Wet).
2. Step Treads: Minimum of 0.6 (Wet).
3. Ramp Surfaces: Minimum of 0.8 (Wet).

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Selection Samples: Color charts illustrating full range of colors and patterns.

E. Selection Samples: Samples of actual tiles for selection.

F. Samples: Mount tile and apply grout on two plywood panels, 36 by 36 inch in size illustrating pattern, color variations, and grout joint size variations.

G. Manufacturer's Certificate:
1. Certify that products meet or exceed specified requirements.
2. For each shipment, type and composition of tile provide a Master Grade Certificate signed by the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.

H. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. Maintain one copy each of all Referenced standards and specifications on site. Include the TCA Handbook, ANSI A108 Series, ANSI A118 Series ANSI A136.1 and ANSI A137.1 and others as specified under paragraph References.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years experience.

C. Single Source Responsibility:
1. Obtain each type and color of tile from a single source.
2. Obtain each type and color of mortar, adhesive and grout from the same source.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging until ready for installation.

B. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.

C. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

1.9 EXTRA MATERIALS

A. Provide 200 sq ft of each size, color, and surface finish of tile specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: As shown on drawings.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 TILE

A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:
   1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
   2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
   3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.

2.3 SETTING MATERIALS

A. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.

B. Epoxy Adhesive: ANSI A118.3, thinset bond type.

C. Mortar Bed Materials:
   1. Portland cement: ASTM C150, type 1, gray or white.
   2. Hydrated Lime: ASTM C207, Type S.
   3. Sand: ASTM C144, fine.
   4. Latex additive: As approved.
   5. Water: Clean and potable.

D. Mortar Bond Coat Materials:
   1. Dry-Set Portland Cement type: ANSI A118.1.
   2. Latex-Portland Cement type: ANSI A118.4.
   3. Epoxy: ANSI A118.3, 100 percent solids.

E. Standard Grout: Cement grout, sanded or unsanded, as specified in ANSI A118.6; color as selected.

F. Polymer modified cement grout, sanded or unsanded, as specified in ANSI A118.7; color as selected.

G. Epoxy Grout: ANSI A118.8, 100 percent solids epoxy grout; color as selected.

H. Silicone Sealant: Silicone sealant, moisture and mildew resistant type, white; use for shower floors and shower walls.

I. Cleavage Membrane:
   1. No. 15 (6.9 kg) asphalt saturated felt, ASTM D226, Type 1.
   2. Polyethylene film, ASTM D4397, 4.0 mil thickness.

J. Waterproofing Membrane at Floors: Membrane in accordance with ANSI A118.10 and as follows:
   1. Chlorinated Polyethylene Sheet with polyester fabric reinforcing.
   2. Fabric Reinforced, Fluid-Applied elastomeric membrane.
   3. Un-Reinforced, Fluid-Applied elastomeric membrane.
   4. Polyethylene Sheet Product..
   5. Fabric-Reinforced, Modified-Bituminous Sheet Product.
   6. Urethane Waterproofing and Tile-Setting Adhesive Product.

K. Membrane at Walls: No. 15 (6.9 kg) asphalt saturated felt, ASTM D226, Type 1.

L. Membrane at Walls: 4 mil (0.1 mm) thick polyethylene film, ASTM D4397.

M. Membrane at Walls: Reinforced asphalt paper.

N. Reinforcing Mesh: 2 by 2 inch (50 by 50 mm) size weave of 16/16 wire size; welded fabric, galvanized.

O. Metal Lath: ASTM C847, Flat expanded diamond mesh, not less than 2.5 lbs/SY, galvanized finish.

P. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced with 2 inch (50 mm) wide coated glass fiber tape for joints and corners:
   1. Thickness: 1/4 inch (6 mm).
   2. Thickness: 1/2 inch (13 mm).
   3. Thickness: 5/8 inch (16 mm).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified in ANSI A137.1, and are ready to receive tile.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A137.1.

C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Remove any curing compounds or other contaminates.

C. Vacuum clean surfaces and damp clean.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.

B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Install thresholds where indicated.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Allow tile to set for a minimum of 48 hours prior to grouting.

L. Grout tile joints. Use standard grout unless otherwise indicated.

M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over exterior concrete substrates, install in accordance with TCA Handbook Method F102, with standard grout.

B. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-portland cement grout.
   2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F131.

C. Over wood substrates, install in accordance with TCA Handbook Method F142, with standard grout, unless otherwise indicated.
   1. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F143.

3.5 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over exterior concrete substrates, install in accordance with TCA F101, bonded, with standard grout.

B. Over interior concrete substrates, install in accordance with TCA Handbook Method F111, with cleavage membrane, unless otherwise indicated.
   1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCA Handbook Method F121.
   2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F132, bonded.
   3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCA Handbook Method F114, with cleavage membrane.

C. Over wood substrates, install in accordance with TCA Handbook method F141, with standard grout, unless otherwise indicated.

D. Cleavage Membrane: Lap edges and ends.

E. Waterproofing Membrane: Install as specified in ANSI A108.13.

F. Mortar Bed Thickness: 1-1/4 to 2 inch (32 to 51 mm) maximum, unless otherwise indicated.

3.6 INSTALLATION - SHOWERS AND BATHTUB WALLS

A. At tiled shower receptors install in accordance with TCA Handbook Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. At bathtub walls install in accordance with TCA Handbook Method B412, over cementitious backer units with waterproofing membrane.

C. Grout with standard grout as specified above.

D. Seal joints between tile work and other work with sealant specified in Section 07 92 00.

3.7 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCA Handbook Method W244, using membrane at toilet rooms.

B. Over cementitious backer units install in accordance with TCA Handbook Method W223, organic adhesive.

C. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.
   1. Where mortar bed is indicated, install in accordance with TCA Handbook Method W222, one coat method.
   2. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.

D. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.

E. Over wood studs without backer install in accordance with TCA Handbook Method W231, mortar bed, with membrane where indicated.

F. Over metal studs without backer install in accordance with TCA Handbook Method W241, mortar bed, with membrane where indicated.

3.8 CLEANING

A. Clean tile and grout surfaces.

3.9 PROTECTION OF FINISHED WORK

A. Do not permit traffic over finished floor surface for 72 hours after installation.

B. Cover floors with kraft paper and protect from dirt and residue from other trades.

C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways

END OF SECTION

SECTION 09 61 00
MOISTURE VAPOR EMISSION CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Moisture vapor emission control system for interior concrete slabs in preparation of floor covering installation, includes:
   1. Moisture vapor emission control solution.
   2. Bond promoter.

1.2 RELATED SECTIONS

A. Section 03 06 00 - Schedules for Concrete.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 07 27 19 - Plastic Sheet Air Barriers .

D. Division 9 Sections for floor coverings applied to concrete substrates.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM D7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
   2. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   3. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
   4. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
   5. ASTM F3191 - Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring.

B. International Concrete Repair Institute (ICRI):
   1. ICRI Guide 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair.

C. U.S. Green Building Council (USGBC):
   1. Leadership in Energy and Environmental Design (LEED).

1.4 DEFINITIONS

A. MVE: Moisture vapor emission.

B. MVER: Moisture vapor emission rate.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.

3. Storage and handling requirements and recommendations.
4. Typical installation methods.

C. Sustainable Design Submittals:
1. Product Data: Indicating VOC content.
2. Laboratory Test Reports: Indicating compliance with low-emitting material requirements.

D. Quality Assurance Submittals:
1. Qualification Data: For Applicator.
2. Product Test Reports: For MVE-control system, indicating compliance with requirements.
3. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section and employs technical-support personnel who are available for product training.

B. Installer Qualifications: Company specializing in performing Work of this section and trained and approved by the manufacturer.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
3. Retain mock-up during construction as a standard for comparison with completed work.
4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: ISE Logik Industries, which is located at: 14231 Seaway Rd. Suite 1003; Gulfport, MS 39503; Toll Free Tel: 877-549-5159; Tel: 585-474-3553; Email:request info (decraft@iselogik.com); Web:http://www.iselogik.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

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

2.3 MVE-CONTROL SYSTEMS

A. Moisture Vapor Emission (MVE) Control Solution: A no limit moisture vapor emission control solution.
   1. Basis of Design: MVEC-710; as manufactured by ISE Logik Industries, Inc.
   2. Approved for use with all flooring systems and types.
   3. No moisture testing required prior to use.

B. Bond Promoter: A one-part next generation bond promoter surface texturizer, encapsulator, and pH barrier.
   1. Basis of Design: MVBP-600; as manufactured by ISE Logik Industries, Inc
   2. Designed for use over MVEC 710 moisture vapor emission control system.
   3. Evidences long-term resistance to water and humidity.
   4. Resistant to solvents, chemicals, and corrosion.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

C. Verify that concrete has achieved a minimum of 3000 psi, or 80 percent of design strength, whichever is greater.

D. Verify that no hydrostatic pressure exists.

3.2 PREPARATION

A. Prepare according to manufacturer's written instructions, industry guidelines, and as follows:
   1. Clean concrete substrates of foreign substances in accordance with ASTM F710 to include, but not limited to, adhesive residue, floor sealers, curing compounds, wall plaster and joint compound, cleaning compounds, wax, oil, dirt, or other substances that could interfere with or block the absorption of product into the concrete surface.
   2. Absorption Testing: Comply with ASTM F3191 to verify an absorptive/porous concrete surface. If substrate does not comply, abrade concrete surface to a concrete surface profile (CSP) complying with ICRI 310.2R CSP 1 to 3 to ensure an absorptive/porous substrate per ASTM F3191.
   3. Bond Testing: Apply system to 100 sq. ft. (9.29 sq. m.) of prepared concrete substrate and test according to ASTM D7234. Proceed with application when bond strength is greater than 200 psi (1.38 MPa) with failure of concrete substrate.

B. Fill and seal cracks with polymer-fortified cementitious patching and leveling compound, installed according to manufacturer's instructions. Do not fill expansion joints or other moving joints.

C. Protect adjacent surfaces during application.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
   1. Do not overapply or allow puddles. Remove excess material with manufacturer's recommended trowel to ensure even distribution.

B. Cure MVE-control solution a minimum of 8 hours, and in accordance with manufacturer's instructions.

C. After curing, repair surface defects, such as pinholes or bubbles with additional MVE-control solution.

D. Apply bond promoter to surface of MVE-control solution: Apply according to manufacturer's instructions and recommended spreading rate:
   1. Roll and cross roll to provide uniform, monolithic surface.
   2. Cure for a minimum of 1 hour, and in accordance with manufacturer's instructions prior to applying flooring adhesives.

3.4 FIELD QUALITY CONTROL

A. Inspect applied system for non-conforming work.

3.5 CLEANING

A. Immediately clean MVE-control system from glass and metal with soap and water, and dry.

3.6 PROTECTION

A. Protect MVE-control system from staining, laitance, and contamination before flooring installation.

B. Do not allow subsequent testing for flooring installation to compromise MVE-control system.

END OF SECTION

SECTION 09 90 00
INTERIOR, EXTERIOR AND INDUSTRIAL PAINTS AND COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior paint and coatings systems (LEED-09 NC/CI/CS Compliant) including surface preparation.

B. Interior high-performance paint and coatings systems including surface preparation.

C. Exterior paint and coatings systems including surface preparation.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 04 20 00 - Unit Masonry: Concrete Masonry Units (CMU) and brick.

C. Section 05 50 00 - Metal Fabrications.

D. Section 06 20 00 - Finish Carpentry.

E. Section 06 40 00 - Architectural Woodwork.

F. Section 08 11 13.16 - Custom Hollow Metal Doors and Frames.

1.3 REFERENCES

A. Steel Structures Painting Council (SSPC):
1. SSPC-SP 1 - Solvent Cleaning.
2. SSPC-SP 2 - Hand Tool Cleaning.
3. SSPC-SP 3 - Power Tool Cleaning.
4. SSPC-SP5/NACE No. 1, White Metal Blast Cleaning.
5. SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
6. SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.
7. SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.
8. SSPC-SP11, Power Tool Cleaning to Bare Metal.
9. SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
10. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

C. South Coast Air Quality Management District (SCAQMD): Rule 1113 - Architectural Coatings.

D. Green Seal, Inc.:
1. GS-11 Standard for Paints and Coatings (1st Edition, May 20,1993).
2. GC-03 - Environmental Criteria for Anti-Corrosive Paints.

E. United States Green Building Council (USGBC): LEED-09 NC/CI/CS.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated, including.
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.
   5. Application methods.
   6. Cautions for storage, handling and installation.

B. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

C. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

D. Only submit complying products based on project requirements (i.e. LEED). One must also comply with the regulations regarding VOCs (CARB, OTC, SCAQMD, LADCO). To ensure compliance with district regulations and other rules, businesses that perform coating activities should contact the local district in each area where the coating will be used.

E. USGBC LEED V4 Submittals:
   1. MRc2 Environmental Product Declaration Product Language: Products shall be selected with a preference to products that have product-specific environmental product declaration documentation.
   2. EQc2 Low Emitting Materials: The VOC content of all adhesives, sealants, paints and coatings in this Section shall not exceed the VOC limits established in Division 01 Sustainable Design sections.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish surfaces for verification of products, colors and sheens.
   2. Finish area designated by Architect.
   3. Provide samples that designate primer and finish coats.
   4. Do not proceed with remaining work until the Architect approves the mock-up.
   5.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.
   1. Product name, and type (description).
   2. Application and use instructions.
   3. Surface preparation.
   4. VOC content.

5. Environmental handling.
6. Batch date.
7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: As specified in drawings.

B. Substitutions: See Drawing Instructions.

2.2 APPLICATIONS/SCOPE

A. Interior Paints and Coatings:(LEED-09 NC/CI/CS COMPLIANT)
1. Concrete: Poured, precast, tilt-up, cast-in-place, cement board, plaster.
2. Concrete: Floors (Non-Vehicular).
3. Masonry: Concrete masonry units, including split-face, scored, and smooth block.
4. Metal: Aluminum, galvanized steel.
5. Metal: Structural steel, joists, trusses, beams, partitions and similar items.
6. Wood: Walls, ceilings, doors, trim and similar items.
7. Drywall: Drywall board, Gypsum board.

B. Interior High Performance Paints and Coatings:
1. Concrete: Poured, precast, tilt-up, cast-in-place, cement board.
2. Concrete: Ceilings.
3. Masonry: CMU - concrete, split face, scored, smooth, stucco.
4. Non-Ferrous Metal: Galvanized steel and aluminum.
5. Metal Ferrous: Ceilings, structural steel, joists, trusses, beams, and similar items including dryfall coatings.
6. Wood: Walls, ceilings, doors, trim, cabinet work, and similar items.
7. Drywall: Drywall board, Gypsum board
8. Plaster: Walls, ceilings.

C. Exterior Paints and Coatings:
   1. Concrete: Cementitious siding, flexboard, transite, and shingles (non-roof).
   2. Masonry: Concrete masonry units, cinder or concrete block.
   3. Concrete: Concrete floors, patios, porches, steps and platforms, (non-vehicular).
   4. Metal: Aluminum, galvanized steel.
   5. Metal: Miscellaneous iron, ornamental iron, ferrous metal.
   6. Wood: Floors (non-vehicular), and platforms.
   7. Wood: Siding, trim, shutters, sash, and miscellaneous hardboard.
   8. Architectural PVC, plastic, fiberglass.
   9. Drywall: Gypsum board, and exterior drywall.
   10. Vinyl: Siding, EIFS, synthetic stucco.

2.3 PAINT MATERIALS - GENERAL

A. Paints and Coatings:
   1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
   2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: Refer to Finish Schedule for paint colors, and as selected.

E. LEED Requirements: Products in compliance with requirements of IEQ Credit 4.2 USGBC LEED-09 NC/CI/CS.

2.4 INTERIOR PAINT SYSTEMS (LEED-V4 NC/CI/CS COMPLIANT)

A. CONCRETE - Walls and Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place including Plaster Walls and Ceilings.
   1. Latex Systems:
      a. Gloss Finish High Performance:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W Pro Industrial Gloss Acrylic Coating, B66-600 Series.
         3) 3rd Coat: S-W Pro Industrial Gloss Acrylic Coating, B66-600 Series (6.0 mils wet, 2.5 mils dry per coat).
      b. Semi-Gloss Finish:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
         3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat).
      c. Semi-Gloss Finish:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series.

3) 3rd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series (4 mils wet, 1.4 mils dry per coat).

d. Semi-Gloss Finish High Performance:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W Pro Industrial Semi-Gloss Acrylic Coating, B66-650 Series.
3) 3rd Coat: S-W Pro Industrial Semi-Gloss Acrylic Coating, B66-650 Series (6.0 mils wet, 2.5 mils dry per coat)

e. Eg-Shel / Satin Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat).

f. Eg-Shel / Satin Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W Harmony Interior Latex Eg-Shel, B9 Series.
3) 3rd Coat: S-W Harmony Interior Latex Eg-Shel, B9 Series (4 mils wet, 1.7 mils dry per coat).

g. Eg-Shel Finish, Microbicidal Paint:
1) 1st Coat: S-W Loxon Block Surfacer, A24W200(50-100 sq ft/gal).
2) 2nd Coat: S-W Paint Shield Microbicidal Paint, D12W51 (4 mils wet, 1.8 mils dry per coat).
3) 3rd Coat: S-W Paint Shield Microbicidal Paint, D12W51 (4 mils wet, 1.8 mils dry per coat).

h. Low Sheen Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series (4 mils wet, 1.6 mils dry per coat).

i. Low Sheen Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Gloss Eg-Shel, B41-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Gloss Eg-Shel, B41-2600 Series (4 mils wet, 1.6 mils dry per coat).

j. Flat Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).

k. Flat Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W Harmony Interior Latex Flat, B5 Series.
3) 3rd Coat: S-W Harmony Interior Latex Flat, B5 Series (4 mils wet, 1.8 mils dry per coat).

2. Alkyd Systems (Water based):
a. Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8

mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series.
3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series (4 mils wet, 1.7 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4 mils wet, 1.7 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series.
3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series (4 mils wet, 1.7 mils dry per coat).

d. Semi-Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

e. Eg-Shel Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series.
3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series (4 mils wet, 1.4 mils dry per coat).

f. Low Sheen Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

3. Epoxy Systems (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15.
2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15 (6 mils wet,2.5 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series (5 mils wet, 2.0 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25.
2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (6 mils wet, 2.5 mils dry per coat).

d. Semi-Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8

mils wet, 3.2 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series (4 mils wet, 1.5 mils dry per coat).

e. Eg-Shel/Low Luster Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series (4 mils wet, 1.5 mils dry per coat).

f. Eg-Shel/Low Luster Finish:
1) 1st Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series.
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series (5 mils wet, 2.0 mils dry per coat).

B. CONCRETE: Ceilings, Poured Concrete, Precast Concrete, Cement Board, Cast-In-Place including Plaster Ceilings.
1. Dryfall Waterborne Topcoats:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (5.8 mils wet, 2.3 mils dry per coat).

b. Eg-Shel Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6 mils wet, 1.9 mils dry per coat).

c. Flat Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6 mils wet, 1.7 mils dry per coat).

C. MASONRY: CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted.
1. Latex Systems:
a. Gloss Finish High Performance:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W Pro Industrial Gloss Acrylic Coating, B66-600 Series.
3) 3rd Coat: S-W Pro Industrial Gloss Acrylic Coating, B66-600 Series (6.0 mils wet, 2.5 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series.
3) 3rd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series (4 mils wet, 1.4 mils dry per coat).

d. Semi-Gloss Finish High Performance:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W Pro Industrial Semi-Gloss Acrylic Coating, B66-650

Series.
3) 3rd Coat: S-W Pro Industrial Semi-Gloss Acrylic Coating, B66-650 Series (6.0 mils wet, 2.5 mils dry per coat).

e. Eg-Shel / Satin Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat).

f. Eg-Shel / Satin Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W Harmony Interior Latex Eg-Shel, B9 Series.
3) 3rd Coat: S-W Harmony Interior Latex Eg-Shel, B9 Series (4 mils wet, 1.7 mils dry per coat).

g. Eg-Shel Finish, Microbicidal Paint:
1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
2) 2nd Coat: S-W Paint Shield Microbicidal Paint, D12W51 (4 mils wet, 1.8 mils dry per coat.
3) 3rd Coat: S-W Paint Shield Microbicidal Paint, D12W51 (4 mils wet, 1.8 mils dry per coat).

h. Low Sheen Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series (4 mils wet, 1.6 mils dry per coat).

i. Low Sheen Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Gloss Eg-Shel, B41-2600 Series.
3) 3rd Coat: S-W 200 Zero VOC Latex Low Gloss Eg-Shel, B41-2600 Series (4 mils wet, 1.6 mils dry per coat).

j. Flat Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).

k. Flat Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W Harmony Interior Latex Flat, B5 Series.
3) 3rd Coat: S-W Harmony Interior Latex Flat, B5 Series (4 mils wet, 1.6 mils dry per coat).

2. Alkyd Systems (Water based):
a. Gloss Finish:
1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series.
3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series (4 mils wet, 1.7 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

c. Semi-Gloss Finish:
    1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
    2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series.
    3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series (4 mils wet, 1.7 mils dry per coat).
d. Semi-Gloss Finish:
    1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
    2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
    3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).
e. Eg-Shel Finish:
    1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
    2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series.
    3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series (4 mils wet, 1.4 mils dry per coat).
f. Low Sheen Finish:
    1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
    2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
    3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

3. Epoxy Systems (Water Based):
a. Gloss Finish:
    1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
    2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15.
    3) 3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15 (6.0 mils wet, 2.5 mils dry per coat).
b. Gloss Finish:
    1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
    2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.
    3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series (5.0 mils wet, 2.0 mils dry per coat).
c. Semi-Gloss Finish:
    1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
    2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25.
    3) 3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (6.0 mils wet, 2.5 mils dry per coat).
d. Semi-Gloss Finish:
    1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
    2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series.
    3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series (4 mils wet, 1.5 mils dry per coat).
e. Eg-Shel/Low Luster Finish:
    1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
    2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series.
    3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series (4.0 mils wet, 1.5 mils dry per coat).
f. Eg-Shel/Low Luster Finish:

1) 1st Coat: S-W Loxon Block Surfacer, A24W200 (50-100 sq ft/gal).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series (5.0 mils wet, 2.0 mils dry per coat).

D. METAL: Aluminum, Galvanized.
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Latex Gloss Enamel, B21-2200 Series.
3) 3rd Coat: S-W ProMar 200 Latex Gloss Enamel, B21-2200 Series (4.0 mils wet, 1.5 mils dry per coat).
b. Gloss Finish High Performance:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series (6-10 mils wet, 2.5-4.0 mils dry per coat).
c. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4.0 mils wet, 1.6 mils dry per coat).
d. Semi-Gloss Finish High Performance:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6-10 mils wet, 2.5-4.0 mils dry per coat).
e. Eg-Shel / Satin Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat).
f. Eg-Shel / Satin Finish High Performance:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel (6-10 mils wet, 2.5-4.0 mils dry per coat).
g. Low Sheen Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series (4 mils wet, 1.6 mils dry per coat).
h. Low Sheen Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Gloss Eg-Shel, B41-

2600 Series.
3) 3rd Coat: S-W 200 Zero VOC Latex Low Gloss Eg-Shel, B41-2600 Series (4 mils wet, 1.6 mils dry per coat).

i. Flat Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).

j. Flat Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Harmony Interior Latex Flat, B5 Series.
3) 3rd Coat: S-W Harmony Interior Latex Flat, B5 Series (4 mils wet, 1.8 mils dry per coat).

2. Alkyd Systems (Water based):
a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series.
3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series (4 mils wet, 1.7 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series.
3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series (4 mils wet, 1.7 mils dry per coat).

d. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

e. Low Sheen Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

3. Epoxy Systems (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15.

3) 3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15 (6.0 mils wet, 2.5 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series (5.0 mils wet, 2.0 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25.
3) 3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (6.0 mils wet, 2.5 mils dry per coat).

d. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series (4 mils wet, 1.5 mils dry per coat).

e. Eg-Shel/Low Luster Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series (4 mils wet, 1.5 mils dry per coat).

f. Eg-Shel/Low Luster Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series (5.0 mils wet, 2.0 mils dry per coat).

4. Urethane System (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Waterbased Acrolon 100, B65-720 series.
3) 3rd Coat: S-W Waterbased Acrolon 100, B65-720 series (4.0 mils wet, 2.0 mils dry per coat).

E. METAL: Galvanized; Ceilings, Duct work.
1. Multi-Surface Acrylic Coating System:
a. Gloss Finish High Performance:
1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-1500 Series.
2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-1500 Series (5.0 mils wet, 2.0 mils dry per coat).

2. Dryfall Waterborne Topcoats:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (5.8 mils wet, 2.3 mils dry per coat).

b. Eg-Shel Finish:

1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6.0 mils wet, 1.9 mils dry per coat).

c. Flat Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6.0 mils wet, 1.7 mils dry per coat).

F. METAL - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous and Ornamental Iron, Structural Iron, Ferrous Metal)

1. Latex Systems:

a. Gloss Finish High Performance:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series (6-10 mils wet, 2.5-4.0 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4.0 mils wet, 1.6 mils dry per coat).

c. Semi-Gloss Finish High Performance:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6-10 mils wet, 2.5-4.0 mils dry per coat).

d. Eg-Shel / Satin Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4.0 mils wet, 1.7 mils dry per coat).

e. Eg-Shel / Satin Finish High Performance:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel B66 Series (6-10 mils wet, 2.5-4.0 mils dry per coat).

f. Low Sheen Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series (4.0 mils wet, 1.6 mils dry per coat).

g. Low Sheen Finish:
1) 1st Coat: S-W Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Gloss Eg-Shel, B41-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Gloss Eg-Shel, B41-2600 Series (4 mils wet, 1.6 mils dry per coat).

h. Flat Finish:
    1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
    2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
    3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4.0 mils wet, 1.6 mils dry per coat).

i. Flat Finish:
    1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
    2) 2nd Coat: S-W Harmony Interior Latex Flat, B5 Series.
    3) 3rd Coat: S-W Harmony Interior Latex Flat, B5 Series (4.0 mils wet, 1.8 mils dry per coat).

2. Alkyd Systems (Water based):
    a. Gloss Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
        2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series.
        3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series (4 mils wet, 1.7 mils dry per coat).
    b. Gloss Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
        2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
        3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series ((4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).
    c. Semi-Gloss Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
        2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series.
        3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series (4.0 mils wet, 1.7 mils dry per coat).
    d. Semi-Gloss Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
        2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
        3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series ((4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).
    e. Low Sheen Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
        2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
        3) 3rd Coat: S-W -W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series ((4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).
3. Epoxy Systems (Water Based):
    a. Gloss Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
        2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15.
        3) 3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15 (6.0 mils wet, 2.5 mils dry per coat).
    b. Gloss Finish:

1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series (5.0 mils wet, 2.0 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25.
3) 3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (6.0 mils wet, 2.5 mils dry per coat).

d. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series (4 mils wet, 1.5 mils dry per coat).

e. Eg-Shel/Low Luster Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series (4 mils wet, 1.5 mils dry per coat).

f. Eg-Shel/Low Luster Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series (5.0 mils wet, 2.0 mils dry per coat).

4. Urethane System (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Waterbased Acrolon 100, B65-720 Series.
3) 3rd Coat: S-W Waterbased Acrolon 100, B65-720 Series (4.0 mils wet, 2 mils dry per coat).

5. Dryfall Waterborne Topcoat:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
3) 3rd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (5.8 mils wet, 2.3 mils dry per coat).

b. Eg-Shel Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
3) 3rd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6.0 mils wet, 1.9 mils dry per coat).

c. Flat Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).

2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
3) 3rd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6.0 mils wet, 1.7 mils dry per coat).

G. WOOD - (Walls, Ceilings, Doors, Trim):
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProClassic Waterborne Acrylic Gloss, B21-51 Series.
3) 3rd Coat: S-W ProClassic Waterborne Acrylic Gloss, B21-51 Series (4 mils wet, 1.5 mils dry per coat).
b. Semi - Gloss Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series.
3) 3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series (4 mils wet, 1.3 mils dry per coat).
c. Eg-Shel / Satin Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProClassic Waterborne Acrylic Satin, B20 Series.
3) 3rd Coat: S-W ProClassic Waterborne Acrylic Satin, B20 Series (4 mils wet, 1.2 mils dry per coat).
d. Eg-Shel Finish, Microbicidal Paint:
1) 1st Coat: S-W PrepRite ProBlock Latex Primer/Sealer, B51 Series (4 mils wet, 1.4 mils dry per coat).
2) 2nd Coat: S-W Paint Shield Microbicidal Paint, D12W51 (4 mils wet, 1.8 mils dry per coat).
3) 3rd Coat: S-W Paint Shield Microbicidal Paint, D12W51 (4 mils wet, 1.8 mils dry per coat).
e. Flat Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111. (4 mils wet, 1.8 mils dry)
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).
2. Alkyd Systems (Water based):
a. Gloss Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series.
3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Gloss, B35-8200 Series (4 mils wet, 1.7 mils dry per coat).
b. Gloss Finish:
1) 1st Coat: S-W Premium Wood & Wall Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).
c. Semi-Gloss Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-

8200 Series.
3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200 Series (4 mils wet, 1.7 mils dry per coat).

d. Semi-Gloss Finish:
1) 1st Coat: S-W Premium Wood & Wall Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series ((4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

e. Eg-Shel Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series.
3) 3rd Coat: S-W ProMar 200 Waterbased Acrylic-Alkyd Eg-Shel, B33-8200 Series (4 mils wet, 1.4 mils dry per coat).

f. Low Sheen Finish:
1) 1st Coat: S-W Premium Wood & Wall Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

3. Stain and Varnish System:
a. Gloss Finish:
1) 1st Coat: S-W WoodClassics 250 Stains.
2) 2nd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series.
3) 3rd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series (4 mils wet, 1.0 mil dry per coat).

b. Satin Finish:
1) 1st Coat: S-W WoodClassics 250 Stains.
2) 2nd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series.
3) 3rd Coat: S-W WoodClassics Waterborne Polyurethane Varnish, A68 Series (4 mils wet, 1.0 mil dry per coat).

H. DRYWALL - (Walls, Ceilings, Gypsum Board and similar items)
1. Latex Systems:
a. Semi-Gloss Finish:
1) 1st Coat: S-W ProMar200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series (4 mils wet, 1.6 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W Harmony Interior Latex Primer, B11 (4 mils wet, 1.3 mils dry).
2) 2nd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series.
3) 3rd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series (4 mils wet, 1.4 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Premium Wall & Wood Interior Latex Primer, B28W08111 (4 mils wet, 1.8 mils dry).

2) 2nd Coat: S-W Emerald Interior Latex Semi-Gloss, K38 Series.
3) 3rd Coat: S-W Emerald Interior Latex Semi-Gloss, K38 Series (4 mils wet, 1.5 mils dry per coat).

d. Eg-Shel / Satin Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils wet, 1.7 mils dry per coat).

e. Eg-Shel / Satin Finish:
1) 1st Coat: S-W Harmony Interior Latex Primer, B11(4 mils wet, 1.3 mils dry).
2) 2nd Coat: S-W Harmony Interior Latex Eg-Shel, B9 Series.
3) 3rd Coat: S-W Harmony Interior Latex Eg-Shel, B9 Series (4 mils wet, 1.7 mils dry per coat).

f. Eg-Shel / Satin Finish:
1) 1st Coat: S-W Premium Wall & Wood Interior Latex Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Emerald Interior Latex Satin, K37 Series.
3) 3rd Coat: S-W Emerald Interior Latex Satin, K37 Series (4 mils wet, 1.7 mils dry per coat).

g. Eg-Shel Finish, Microbicidal Paint:
1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W Paint Shield Microbicidal Paint, D12W51 (4 mils wet, 1.8 mils dry per coat).
3) 3rd Coat: S-W Paint Shield Microbicidal Paint, D12W51 (4 mils wet, 1.8 mils dry per coat).

h. Low Sheen Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Low Sheen Enamel, B24-2600 Series (4 mils wet, 1.6 mils dry per coat).

i. Low Sheen Finish:
1) 1st Coat: S- Premium Wall & Wood Interior Latex Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Emerald Interior Acrylic Latex Matte, K36 Series.
3) 3rd Coat: S-W Emerald Interior Acrylic Latex Matte, K36 Series (4 mils wet, 1.6 mils dry per coat).

j. Flat Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series.
3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Flat, B30-2600 Series (4 mils wet, 1.6 mils dry per coat).

k. Flat Finish:
1) 1st Coat: S-W Harmony Interior Latex Primer, B11 (4 mils wet, 1.3 mils dry).
2) 2nd Coat: S-W Harmony Interior Latex Flat, B5 Series.
3) 3rd Coat: S-W Harmony Interior Latex Flat, B5 Series (4 mils wet, 1.8 mils dry per coat).

l. Flat Finish:
1) 1st Coat: S-W Premium Wall & Wood Interior Latex Primer, B28W08111 (4 mils wet, 1.8 mils dry).

2) 2nd Coat: S-W Emerald Interior Acrylic Latex Flat. K35 Series.
3) 3rd Coat: S-W Emerald Interior Acrylic Latex Flat. K35 Series (4 mils wet, 1.6 mils dry per coat).

2. Epoxy Systems (Water Based):
   a. Gloss Finish:
      1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
      2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15.
      3) 3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V15 (6.0 mils wet, 2.5 mils dry per coat).
   b. Gloss Finish:
      1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
      2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series.
      3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-300 Series (5.0 mils wet, 2.0 mils dry per coat).
   c. Semi-Gloss Finish:
      1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
      2) 2nd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25.
      3) 3rd Coat: S-W Waterbased Catalyzed Epoxy, B70W211/ B60V25 (6.0 mils wet, 2.5 mils dry per coat).
   d. Semi-Gloss Finish:
      1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
      2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series.
      3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K46-Series (4 mils wet, 1.5 mils dry per coat).
   e. Eg-Shel/Low Luster Finish:
      1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
      2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series.
      3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series (4 mils wet, 1.5 mils dry per coat).
   f. Eg-Shel/Low Luster Finish:
      1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
      2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series.
      3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy, B73-360 Series (5.0 mils wet, 2.0 mils dry per coat).

I. Concrete - (Floors, non-vehicular):
   1. Latex Systems:
      a. Semi Gloss Finish:
         1) 1st Coat: S-W Tread-Plex Primer Acrylic Floor Coating, B90W110.
         2) 2nd Coat: S-W Tread-Plex Acrylic Floor Coating, B90 Series.
         3) 3rd Coat: S-W Tread-Plex Acrylic Floor Coating, B90 Series (3.5 mils wet, 1.5 mils dry, per coat).
      b. Satin Finish:
         1) 1st Coat: S-W Porch and Floor Enamel, A32-200 Series.
         2) 2nd Coat: S-W Porch and Floor Enamel, A32-200 Series (4 mils wet, 1.5 mils dry per coat).

2.5 HIGH PERFORMANCE INTERIOR PAINT SYSTEMS

A. CONCRETE - Smooth (Walls and Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place).
   1. Latex Systems:
      a. Gloss Finish:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series.
         3) 3rd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series (6.0-10.0 mils wet, 2.5-4.0 mils dry per coat).
      b. Semi-Gloss Finish:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
         3) 3rd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6-10 mils wet, 2.5-4.0 mils dry per coat).
      c. Eg-Shel/Satin Finish:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel, B66 Series.
         3) 3rd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel B66 Series (6.0-10.0 mils wet, 2.5-4.0 mils dry per coat).
      d. Flat Finish:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 dry).
         2) 2nd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11
         3) 3rd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W1 (5.0-10.0 mils wet, 1.9-3.9 mils dry per coat).
   2. Alkyd Systems (Water Based):
      a. Gloss Finish:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
         3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).
      b. Semi-Gloss Finish:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
         3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).
      c. Low Sheen Finish:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 mils dry).
         2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
         3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).
   3. Alkyd System (Solvent Base Finish):
      a. Gloss Finish Urethane Modified:
         1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 dry).
         2) 2nd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150

Series.
3) 3rd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150 Series (3.5-7.0 mils wet, 2.0-4.0 mils dry per coat).

4. Epoxy Systems (Water Based):
   a. Gloss Finish:
      1) 1st Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series.
      2) 2nd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series (6.5-8.0 mils wet, 2.5-3.0 mils dry per coat).
   b. Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series.
      2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).
   c. Semi-Gloss/High Luster Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 dry).
      2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series.
      3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series (4 mils wet, 1.5 mils dry per coat).
   d. Eg-Shel/Low Luster Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 dry).
      2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series.
      3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45-Series (4 mils wet, 1.5 mils dry per coat).
   e. Eg-Shel/Low Luster Finish:
      1) 1st Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series.
      2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

5. Epoxy Systems (Solvent Base):
   a. Gloss Finish:
      1) 1st Coat: S-W Pro Industrial High Performance Epoxy Gloss, B67-200 Series.
      2) 2nd Coat: S-W Pro Industrial High Performance Epoxy Gloss, B67-200 Series (5.0-10.0 mils wet, 4-8.0 mils dry per coat).
   b. Gloss Finish:
      1) 1st Coat: S-W Tile-Clad HS Epoxy Gloss, B62Z/B60VZ70 Series.
      2) 2nd Coat: S-W Tile-Clad HS Epoxy Gloss, B62Z/B60VZ70 Series (4.0-7.0 mils wet, 2.5-4.0 mils dry per coat).

6. Urethane System (Water Based):
   a. Gloss Finish:
      1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18 mils wet, 10 mils dry).
      2) 2nd Coat: S-W Pro Industrial Waterbased Acrolon 100 Gloss, B65-720 Series.
      3) 3rd Coat: S-W Pro Industrial Waterbased Acrolon 100 Gloss, B65-720 Series (4.0-8.0 mils wet, 1.8-3.6 mils dry per coat).
   b. Gloss Finish Single Component:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 dry).
      2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Urethane Gloss, B65-120 Series.

3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Urethane Gloss, B65-1 20 Series (6.0-12.0 mils wet, 1.9-3.8 mils dry per coat).

B. CONCRETE - (Ceilings).
1. MultiSurface Acrylic Coating:
a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic Gloss, B66-1500 Series.
2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Gloss, B66-1500 Series (3.7-5.0 mils wet, 1.5-2.0 mils dry per coat).
b. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic Semi-Gloss, B66-1550 Series.
2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Semi-Gloss, B66-1550 Series (3.75-5.0 mils wet, 1.5-2.0 mils dry per coat).
c. Eg-Shel Finish:
1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-1560 Series.
2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-1560 Series (3.75-5.0 mils wet, 1.5-2.0 mils dry per coat).
2. Dryfall Waterborne Topcoats:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss, B42-80 Series (6.0-9.0 mils wet, 2.3-3.5 mils dry per coat).
b. Eg-Shel Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42-80 Series (6.0-9.0 mils wet, 2.0-3.0 mils dry per coat).
c. Flat Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series (6.0-9.0 mils wet, 1.5-2.3 mils dry per coat).
3. Dryfall Alkyd Topcoats:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 dry).
2) 2nd Coat: S-W Super Save-Lite Dryfall, B47W62.
3) 3rd Coat: S-W Super Save-Lite Dryfall, B47W62(6.0-6.5 mils wet, 3.0-3.5 mils dry).
b. Flat Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (8 mils wet, 3.2 dry).
2) 2nd Coat: S-W Dry Fall Flat, B48W60
3) 3rd Coat: S-W Dry Fall Flat, B48W60 (8 mils wet, 3 mils dry).

C. MASONRY - (CMU - Concrete, Split Face, Scored, Smooth, High Density, Low Density, Fluted, Stucco).
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series.

3) 3rd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series (6-10 mils wet, 2.5-4.0 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6-10 mils wet, 2.5-4.0 mils dry per coat).

c. Eg-Shel/Satin Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, Eg-Shel (6-9.5 mils wet, 2.5-4.0 mils dry per coat).

d. Flat Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11 (5.0-10.0 mils wet, 1.9-3.9 mils dry per coat).

2. Alkyd Systems (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

c. Low Sheen Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 series.
3) 3rd Coat: S-W Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

3. Alkyd System (Solvent Base Finish):
a. Gloss Finish Urethane Modified:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150 Series.
3) 3rd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150 Series (3.5 -7.0 mils wet, 2.0-4.0 mils dry per coat)

4. Epoxy System (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series.

3) 3rd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series (6.5-8.0 mils wet, 2.5-3.0 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

c. Semi-Gloss/High Luster Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series (4 mils wet, 1.5 mils dry per coat).

d. Eg-Shel/Low Luster Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series (4 mils wet, 1.5 mils dry per coat).

e. Eg-Shel/Low Luster Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-13.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

5. Epoxy Systems (Solvent Base Finish):
a. Gloss Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Pro Industrial High Performance Epoxy Gloss, B67-200 Series.
3) 3rd Coat: S-W Pro Industrial High Performance Epoxy Gloss, B67-200 Series (5.0-10.0 mils wet, 4.0-8.0 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils wet).
2) 2nd Coat: S-W Tile-Clad HS Epoxy Gloss, B62Z/B60VZ Series.
3) 3rd Coat: S-W Tile-Clad HS Epoxy Gloss, B62Z/B60VZ Series (4.0-7.0 mils wet, 2.5-4.0 mils dry per coat).

6. Urethane Systems (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Waterbased Acrolon 100 Gloss, B65-720 Series.
3) 3rd Coat: S-W Pro Industrial Waterbased Acrolon 100 Gloss, B65-720 Series (4.0-8.0 mils wet, 1.8-3.6 mils dry per coat).

b. Gloss Finish Single Component:
1) 1st Coat: S-W Heavy Duty Block Filler, B42W46 (18.0-34.0 mils wet, 10.0-18.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Urethane

Gloss, B65-120 Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Urethane Gloss, B65-120 Series (6.0-12.0 mils wet1.9-3.8 mils dry per coat).

7. Urethane Systems (Solvent Base Finish):
   a. Gloss Finish:
      1) 1st Coat: Kem Cati-Coat HS Epoxy Filler/Sealer, B42-400 Series (14.0-28.0 mils wet, 10.0-20.0 mils dry).
      2) 2nd Coat: S-W Hi-Solids PolyurethaneGloss, B65/B60-30Series.
      3) 3rd Coat: S-W Hi-Solids PolyurethaneGloss, B65/B60-30 Series (4.5-8.0 mils wet, 3.0-5.0 mils dry per coat).
   b. Semi-Gloss Finish:
      1) 1st Coat: Kem Cati-Coat HS Epoxy Filler/Sealer, B42-400 Series (14.0-28.0 mils wet, 10.0-20.0 mils dry).
      2) 2nd Coat: S-W Hi-Solids Polyurethane Semi-Gloss, B65-350/B60V30 Series.
      3) 3rd Coat: S-W Hi-Solids Polyurethane Semi-Gloss, B65-350/B60V30 Series (4.5-8.0 mils wet, 3.0-5.0 mils dry per coat).

D. Non-Ferrous- (Galvanized and Aluminum):
1. Latex Systems:
   a. Gloss Finish:
      1) 1st Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series.
      2) 2nd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series (6.0-10.0 mils wet, 2.5-4.0 mils dry per coat).
   b. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
      2) 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6.0-10.0 mils wet, 2.5-4.0 mils dry per coat).
   c. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry per coat).
      2) 2nd Coat: S-W Metalatex Semi-Gloss Coating, B42 Series.
      3) 3rd Coat: S-W Metalatex Semi-Gloss Coating, B42 Series (4.0-11.0 mils wet, 1.5-4.0 mils dry per coat).
   d. Eg-Shel/Satin Finish:
      1) 1st Coat: S-W Pro Industrial DTM Acrylic Eg-Shel, B66 Series.
      2) 2nd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel (6.0- 9.5 mils wet, 2.5-4.0 mils dry per coat).
   e. Flat Finish:
      1) 1st Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11 (5.0-10.0 mils wet, 1.9-3.9 mils dry per coat).
      2) 2nd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11 (5.0-10.0 mils wet, 1.9-3.9mils dry per coat).
2. Alkyd System (Water Based):
   a. Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
      2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
      3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).
   b. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
      2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.

3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

c. Low Sheen Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

3. Alkyd System (Solvent Base Finish):
a. Gloss Finish Urethane Modified:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150 Series.
3) 3rd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150 Series (3.5-7.0 mils wet, 2.0-4.0 mils dry per coat).

4. Epoxy Systems (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15.
2) 2nd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 (6.5-8.0 mils wet, 2.5-3.0 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46-K46- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series (4.0 mils wet, 1.5 mils dry per coat).

d. Eg-Shel Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series (4.0 mils wet, 1.5 mils dry per coat).

e. Eg-Shel Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series (5.0-10 mils wet, 2.0-4.0 mils dry per coat).

5. Epoxy Systems (Solvent Base):
a. Gloss Finish:
1) 1st Coat: S-W Tile-Clad HS Epoxy, B62Z/B60VZ Series.
2) 2nd Coat: S-W Tile-Clad HS Epoxy, B62Z/B60VZ Series (4.0-7.0 mils wet, 2.5-4.0 mils dry per coat).

b. Semi-Gloss Finish:

1) 1st Coat: S-W Macropoxy 646 Fast Cure Epoxy Semi-Gloss, B58-600 Series.
2) 2nd Coat: S-W Macropoxy 646 Fast Cure Epoxy Semi-Gloss, B58-600 Series (7.0-13.5 mils wet, 5.0-10.0 mils dry per coat).

6. Urethane Systems (Water Based):
   a. Gloss Finish:
      1) 1st Coat: S-W DTM Wash Primer, B71Y1 (3.4-6.4 mils wet, 0.7-1.3 mils dry).
      2) 2nd Coat: S-W Pro-Industrial Waterbased Acrolon 100 Gloss, B65-720 Series.
      3) 3rd Coat: S-W Pro-Industrial Waterbased Acrolon 100 Gloss, B65-720 Series (4.0-8.0 mils wet, 1.8-3.6 mils dry per coat).
   b. Gloss Finish Single Component:
      1) 1st Coat: S-W DTM Wash Primer, B71Y1 (3.4-6.4 mils wet, 0.7-1.3 mils dry).
      2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Urethane Gloss, B65-120 Series.
      3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Urethane Gloss, B65-120 Series (6.0-12.0 mils wet1.9-3.8mils dry per coat).
7. Urethane Systems (Solvent Base):
   a. Gloss Finish:
      1) 1st Coat: S-W DTM Wash Primer, B71Y1 (3.4-6.4 mils wet, 0.7-1.3 mils dry).
      2) 2nd Coat: S-W Hi-Solids Polyurethane Gloss, B65/B60-30 Series.
      3) 3rd Coat: S-W Hi-Solids Polyurethane Gloss, B65/B60-30 Series (4.5-8.0 mils wet, 3.0-5.0 mils dry per coat).
   b. Semi-Gloss Finish:
      1) 1st Coat: S-W DTM Wash Primer, B71Y1 (3.4-6.4 mils wet, 0.7-1.3 mils dry).
      2) 2nd Coat: S-W Hi-Solids Polyurethane Semi-Gloss, B65-350/B60V30 Series.
      3) 3rd Coat: S-W Hi-Solids Polyurethane Semi-Gloss, B65-350/B60V30 Series (4.5-8.0 mils wet, 3.0-5.0 mils dry per coat).
8. Multi-Surface Acrylic Coating:
   a. Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic Gloss, B66-1500 Series.
      2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Gloss, B66-1500 Series (3.7-5.0 mils wet, 1.5-2.0 mils dry per coat).
   b. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic Semi-Gloss, B66-1550 Series.
      2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Semi-Gloss, B66-1550 Series (3.75-5.0 mils wet, 1.5-2.0 mils dry per coat).
   c. Eg-Shel Finish:
      1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-1560 Series.
      2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-1560 Series (3.75-5.0 mils wet, 1.5-2.0 mils dry per coat).
9. Dryfall Waterborne Topcoats:
   a. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss,B42-80 Series.
      2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss, B42-80 Series (6.0-9.0 mils wet, 2.3-3.5 mils dry per coat).
   b. Eg-Shel Finish:

1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42-80 Series (6.0-9.0 mils wet, 2.0-3.0 mils dry per coat).

c. Flat Finish:
1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series.
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series (6.0-9.0 mils wet, 1.5-2.3 mils dry per coat).

10. Dryfall Alkyd Topcoats:
a. Semi-Gloss Finish:
1) 1st Coat: S-W DTM Wash Primer, B71Y1 (3.4-6.4 mils wet, 0.7-1.3 mils dry).
2) 2nd Coat: S-W Super Save-Lite Dryfall Semi-Gloss, B47W62.
3) 3rd Coat: S-W Super Save-Lite Dryfall Semi-Gloss, B47W62 (6.0-7.0 mils wet, 3.0-3.5 mils dry).

b. Flat Finish:
1) 1st Coat: S-W DTM Wash Primer, B71Y1 (3.4-6.4 mils wet, 0.7-1.3 mils dry).
2) 2nd Coat: S-W Dry Fall Flat, B48W60.
3) 3rd Coat: S-W Dry Fall Flat, B48W60 (8 mils wet, 3 mils dry).

E. METAL - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous and Ornamental Iron, Structural Iron, Ferrous Metal).
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series.
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series (6.0-10.0 mils wet, 2.5-4.0 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6.0-10.0 mils wet, 2.5-4.0 mils dry per coat).

c. Eg-Shel/Satin Sheen:
1) 1st Coat: S-W Pro Industrial DTM Acrylic Eg-Shel, B66 Series.
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel (6.0-10.0 mils wet, 2.5-4.0 mils dry per coat).

d. Flat Finish:
1) 1st Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11 (5.0-10.0 mils wet, 1.9-3.9 mils dry per coat).

2. Alkyd Systems (Water based):
a. Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

c. Low Sheen Finish:
    1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
    2) 2nd Coat:S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
    3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

3. Alkyd System (Solvent Base Finish):
    a. Gloss Finish Urethane Modified:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
        2) 2nd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150 Series.
        3) 3rd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150 Series (3.5-7.0 mils wet, 2.0-4.0 mils dry per coat).
4. Epoxy Systems (Water Based):
    a. Gloss Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
        2) 2nd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series.
        3) 3rd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series (6.5-8.0 mils wet, 2.5-3.0 mils dry per coat).
    b. Gloss Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
        2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series.
        3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).
    c. Semi-Gloss Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
        2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series.
        3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series (4 mils wet, 1.5 mils dry per coat).
    d. Eg-Shel Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
        2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series.
        3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series (4 mils wet, 1.5 mils dry per coat).
    e. Eg-Shel Finish:
        1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
        2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series.
        3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).
5. Epoxy System (Solvent Base):
    a. Semi-Gloss Finish:
        1) 1st Coat: S-W Recoatable Epoxy Primer, B67 Series. (6.0-9.0 mils wet, 4.0-6.0 mils dry).
        2) 2nd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.

3) 3rd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series. (7.0-13.5 mils wet, 5.0-10.0 mils dry per coat).

6. Urethane System (Water Based):
   a. Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series. (5.0-10.0 mils wet, 1.8-3.6 mils dry).
      2) 2nd Coat: S-W Pro Industrial Water Based Acrolon 100 Gloss, B65-720 Series.
      3) 3rd Coat: S-W Pro Industrial Water Based Acrolon 100 Gloss, B65-720 Series. (4.0-8.0 mils wet, 1.8-3.6 mils dry per coat).
   b. Gloss Finish Single Component:
      1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series. (5.0-10.0 mils wet, 1.8-3.6 mils dry).
      2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Urethane Gloss, B65-120 Series.
      3) 3rd Coat: S-W Pro Industrial Pre-Catalyed Waterbased Urethane Gloss, B65-120 Series. (6.0-12.0 mils wet, 1.9-3.8mils dry per coat).
7. Urethane System (Solvent Base):
   a. Gloss Finish:
      1) 1st Coat: S-W Recoatable Epoxy Primer, B67-5 Series. (6.0-9.0 mils wet, 4.0-6.0 mils dry).
      2) 2nd Coat: S-W Hi-Solids Polyurethane Gloss, B65-300 Series.
      3) 3rd Coat: S-W Hi-Solids Polyurethane Gloss, B65-300 Series. (4.5-8.0 mils wet, 3.0-5.0 mils dry per coat).
   b. Semi-Gloss Finish:
      1) 1st Coat: S-W Recoatable Epoxy Primer, B67-5 Series. (6.0-9.0 mils wet, 4.0-6.0 mils dry).
      2) 2nd Coat: S-W Hi-Solids Polyurethane Semi-Gloss, B65-350 Series.
      3) 3rd Coat: S-W Hi-Solids Polyurethane Semi-Gloss, B65-350 Series. (4.5-8.0 mils wet, 3.0-5.0 mils dry per coat).

F. METAL - (Ceilings - Structural Steel, Joists, Trusses, Beams).
1. MultiSurface Acrylic Coating:
   a. Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic Gloss, B66-1500 Series.
      2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Gloss, B66-1500 Series (3.75-5.0 mils wet, 1.5-2.0 mils dry per coat).
   b. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic Semi-Gloss, B66-1550 Series.
      2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Semi-Gloss, B66-1550 Series (3.75-5.0 mils wet, 1.5-2.0 mils dry per coat).
   c. Eg-Shel Finish:
      1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-1560 Series.
      2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel, B66-1560 Series (3.75-5.0 mils wet, 1.5-2.0 mils dry per coat).
2. Dryfall Waterborne Topcoats:
   a. Semi-Gloss Finish:
      1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
      2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss, B42-80 Series.
      3) 3rd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Semi-Gloss, B42-80 Series (6.0-9.0 mils wet, 2.3-3.5 mils dry per coat).

b. Eg-Shel Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series. (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42-80 Series.
3) 3rd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Eg-Shel, B42-80 Series (6.0-9.0 mils wet, 2.0-3.0 mils dry per coat).

c. Flat Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series.
3) 3rd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series (6.0-9.0 mils wet, 1.5-2.3 mils dry per coat).

3. Dryfall Alkyd Topcoats:
a. Semi-Gloss Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series(5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Super Save-Lite Dryfall Semi-Gloss, B47W62.
3) 3rd Coat: S-W Super Save-Lite Dryfall Semi-Gloss, B47W62 (6.0-7.0 mils wet, 3.0-3.5 mils dry per coat).

b. Flat Finish:
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
2) 2nd Coat: S-W Dry Fall Flat, B48W60 3rd Coat: S-W Dry Fall Flat, B48W60(8 mils wet, 3 mils dry).

G. WOOD- (Doors, Trim, Partitions, Frames).
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111, (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66-600 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66-600 Series (6.0-12.0 mils wet, 2.1-4.2 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111, (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66-650 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66-650 Series (6.0-12.0 mils wet, 2.1-4.2 mils dry per coat).

c. Eg-Shel/Satin Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111, (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel, B66-660 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic, Eg-Shel, B66-660 Series (6.0-12.0 mils wet, 2.1-4.2 mils dry per coat).

d. Flat Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11 (5.0-10.0 mils wet, 1.9-3.9 mils dry per coat).

2. Alkyd Systems (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet,

1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

c. Low-Sheen Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

3. Alkyd System (Solvent Base Finish):
a. Gloss Finish Urethane Modified:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150 Series.
3) 3rd Coat: S-W Pro Industrial Urethane Alkyd Enamel Gloss, B54-150 Series. (3.5-7.0 mils wet, 2.0-4.0 mils dry per coat).

4. Epoxy System (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series.
3) 3rd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series. (6.5-8.0 mils wet, 2.5-3.0 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series. (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series. (4 mils wet, 1.5 mils dry per coat).

d. Eg-Shel Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series. (4 mils wet, 1.5 mils dry per coat).

e. Eg-Shel Finish:
1) 1st Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series. (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

5. Epoxy System (Solvent Base):
a. Semi-Gloss Finish:
1) 1st Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series.
2) 2nd Coat: S-W Macropoxy 646 Fast Cure Epoxy, B58-600 Series (7.0-13.5 mils wet, 5.0-10.0 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W Pro Industrial High Performance Epoxy, B67-200 Series.
2) 2nd Coat: S-W Pro Industrial High-Performance Epoxy, B67-200 Series. (5.0-10.0 mils wet, 4.0-8.0 mils dry per coat).

c. Gloss Finish:
1) 1st Coat: S-W Tile-Clad HS Epoxy, B62Z/B60VZ70 Series.
2) 2nd Coat: S-W Tile-Clad HS Epoxy, B62Z/B60VZ70 Series (4.0-7.0 mils wet, 2.5-4.0 mils dry per coat).

H. DRYWALL - (Walls, Ceilings, Gypsum Board).
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Gloss, B66 Series (6.0-10 mils wet, 2.5-4.0 mils dry per coat).

b. Semi-Gloss Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
3) 3rd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6.0-10 mils wet, 2.5-4.0 mils dry per coat).

c. Eg-Shel/Satin Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W Pro Industrial DTM Acrylic Eg-Shel, B66 Series.
3) 3rd Coat: S-W Industrial DTM Acrylic Eg-Shel, (6.0-10 mils wet, 2.5-4.0 mils dry per coat).

d. Flat Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W DTM Acrylic Primer/Finish, B66W11.
3) 3rd Coat: S-W DTM Acrylic Primer/Finish, B66W11 (5.0-10.0 mils wet, 1.9-3.9 mils dry per coat).

2. Alkyd Systems (Water Based):
a. Gloss Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Waterbased Industrial Enamel, B53-300 Series.
3) 3rd Coat: S-W Waterbased Industrial Enamel, B53-300 Series. (4.5-8.5 mils wet, 1.5-3.0 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0

mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Gloss, B53-1050 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

d. Low Sheen Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Alkyd Urethane Enamel Low Sheen, B53-1250 Series (4.0-5.0 mils wet, 1.4 - 1.7 mils dry per coat).

3. Epoxy Systems (Water Based):

a. Gloss Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series.
3) 3rd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series. (6.5-8.0 mils wet, 2.5-3.0 mils dry per coat).

b. Gloss Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series. (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Water Based Catalyzed Epoxy Semi-Gloss, B70/B60V25 Series.
3) 3rd Coat: S-W Water Based Catalyzed Epoxy Semi-Gloss, B70/B60V25 Series. (6.0-8.0 mils wet, 2.5-3.0 mils dry per coat).

d. Semi-Gloss Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer,B280W2600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series. (4 mils wet, 1.5 mils dry per coat).

e. Eg-Shel Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series. (4 mils wet, 1.5 mils dry per coat).

f. Eg-Shel Finish:

1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series. (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

4. Epoxy System (Solvent Base):
   a. Gloss Finish:
      1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
      2) 2nd Coat: S-W Pro Industrial High Performance Epoxy, B67-200 Series.
      3) 3rd Coat: S-W Pro Industrial High Performance Epoxy, B67-200 Series. (5.0-10.0 mils wet, 4.0-8.0 mils dry per coat).
   b. Gloss Finish:
      1) 1st Coat: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4.0 mils wet, 1.0 mils dry).
      2) 2nd Coat: S-W Tile-Clad HS Epoxy Gloss, B62Z/B60VZ70 Series.
      3) 3rd Coat: S-W Tile-Clad HS Epoxy Gloss, B62Z/B60VZ70 Series. (4.0-7.0 mils wet, 2.5-4.0 mils dry per coat).

I. PLASTER - (Walls, Ceilings).
1. Latex Systems:
   a. Gloss Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
      2) 2nd Coat: S-W Pro Industrial Acrylic Coating Gloss, B66-600 Series.
      3) 3rd Coat: S-W Pro Industrial Acrylic Coating Gloss, B66-600 Series. (6.0-12.0 mils wet, 2.1-4.2 mils dry per coat).
   b. Semi-Gloss Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
      2) 2nd Coat: S-W Pro Industrial Acrylic Coating Semi-Gloss, B66-650 Series.
      3) 3rd Coat: S-W Pro Industrial Acrylic Coating Semi-Gloss, B66-650 Series. (6.0-12.0 mils wet, 2.1-4.2 mils dry per coat).
   c. Low Sheen Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
      2) 2nd Coat: S-W Pro Industrial Acrylic Coating Eg-Shel, B66-660 Series.
      3) 3rd Coat: S-W Pro Industrial Acrylic Coating Eg-Shel, B66-660 Series. (6.0-12.0 mils wet, 2.1-4.2 mils dry per coat).
   d. Flat Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
      2) 2nd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11.
      3) 3rd Coat: S-W Pro Industrial DTM Acrylic Primer/Finish, B66W11 (5.0-10 mils wet, 1.9- 3.9 mils dry per coat).
2. Epoxy Systems (Water Based):
   a. Gloss Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
      2) 2nd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series.
      3) 3rd Coat: S-W Water Based Catalyzed Epoxy Gloss, B70/B60V15 Series. (6.5-8.0 mils wet, 2.5-3.0 mils dry per coat).
   b. Gloss Finish:

1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Gloss, B73-300 Series. (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss, K46- Series. (4.0 mils wet, 1.5 mils dry per coat).

d. Eg-Shel Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series.
3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy Eg-Shel, K45- Series. (4.0 mils wet, 1.5 mils dry per coat).

e. Eg-Shel Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
2) 2nd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series.
3) 3rd Coat: S-W Pro Industrial Water Based Catalyzed Epoxy Eg-Shel, B73-360 Series. (5.0-10.0 mils wet, 2.0-4.0 mils dry per coat).

2.6 EXTERIOR PAINT SYSTEMS

A. CONCRETE (Cementitious Siding, Flexboard, Transite Board, Shingles (Non-Roof), Common Brick, Stucco, Tilt-up, Precast, and Poured-in-place Cement).
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8 Series (4.0 mils wet, 1.3 mils dry per coat).

b. Gloss Finish- Early Moisture Resistant:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
2) 2nd Coat: S-W Resilience Exterior Latex Gloss, K44 Series.
3) 3rd Coat: S-W Resilience Exterior Latex Gloss, K44 Series (4.0 mils wet, 1.6 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.
3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4.0-11.0 mils wet, 1.5-4.0 mils dry per coat).

d. Satin Finish:
1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 dry).
2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4.0 mils wet, 1.5

mils dry per coat).

e. Satin Finish- Early Moisture Resistant:
   1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
   2) 2nd Coat: S-W Resilience Exterior Latex Satin, K43 Series.
   3) 3rd Coat: S-W Resilience Exterior Latex Satin, K43 Series (4.0 mils wet, 1.6 mils dry per coat).

f. Flat Finish:
   1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
   2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series.
   3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4.0 mils wet, 1.2 mils dry per coat).

g. Flat Finish- Early Moisture Resistant:
   1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
   2) 2nd Coat: S-W Resilience Exterior Latex Flat, K42 Series.
   3) 3rd Coat: S-W Resilience Exterior Latex Flat, K42 Series (4.0 mils wet, 1.6 mils dry per coat).

h. High Build Coating:
   1) 1st Coat: S-W Loxon XP, A24-1400 Series (14.0-18.0 mils wet; 6.4-8.3 mils dry).

2. Elastomeric System: Not including cementitious siding, Flexboard, Transite board or shingles (non-roof).
   a. Flat Finish:
      1) 1st Coat: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300 (5.3-8.0 mils wet, 2.1-3.2 mils dry).
      2) 2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series.
      3) 3rd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series (13.0-16.0 mils wet, 6.0-7.5 mils dry per coat).
   b. Flat Finish:
      1) 1st Coat: S-W Loxon BlockSurfacer, A24W00200 (16.0 mils wet, 8.8 mils dry).
      2) 2nd Coat: S-W SherLastic Elastomeric Masonry Coating, A5-600 Series.
      3) 3rd Coat: S-W SherLastic Elastomeric Masonry Coating, A5-600 Series (10.0-14.0 mils wet, 4.0-6.0 mils dry per coat).

3. Textured Elastomeric System:
   a. Textured Finish:
      1) 1st Coat: S-W Loxon BlockSurfacer, A24W00200 (16.0 mils wet, 8.8 mils dry).
      2) 2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series (13.0-16.0 mils wet,6.0- 7.5 mils dry per coat).
      3) 3rd Coat: S-W ConFlex XL Textured Elastomeric High Build Coating, A5-800 (20.0-23.0 mils wet, 9.4-11.0 mils dry per coat).
         a) Finish Texture: Fine.
         b) Finish Texture: Medium.
         c) Finish Texture: Extra Coarse.

4. Textured and Smooth Systems:
   a. Textured (Water Based Finish):
      1) 1st Coat: S-W Loxon BlockSurfacer, A24W00200 (16.0 mils wet, 8.8 mils dry).
      2) 2nd Coat: S-W UltraCrete Textured Masonry Topcoat A44-800 Series (50-80 sq ft/gal).
         a) Finish Texture: Fine.
         b) Finish Texture: Medium.

c) Finish Texture: Extra Coarse.

b. Textured Finish (Solvent Based):
1) 1st Coat: S-W UltraCrete Smooth Waterproofing Masonry Coating, B46 Series (100-160 sq ft/gal).
2) 2nd Coat: S-W UltraCrete Textured Waterproofing Masonry Coating, B46 Series (50-80 sq ft/gal).
a) Finish Texture: Fine.
b) Finish Texture: Medium.
c) Finish Texture: Extra Coarse.

c. Smooth (Water Based Finish):
1) 1st Coat: S-W Loxon XP, A24-1400 Series.
2) 2nd Coat: S-W Loxon XP, A24-1400 Series (14.0-18.0 mils wet; 6.4-8.3 mils dry per coat).

5. Stain System:
a. Solid Color Waterborne Finish:
1) 1st Coat: S-W Loxon Vertical Concrete Stain, A31 Series.
2) 2nd Coat: S-W Loxon Vertical Concrete Stain, A31 Series (50-250 sq/ft gal).

6. Clear Water Repellant:
a. Clear:
1) 1st Coat: S-W Loxon 7% Siloxane Water Repellant, A10T7.
2) 2nd Coat: S-W Loxon 7% Siloxane Water Repellant, A10T7 (50-200 sq ft/ gal).

B. MASONRY: Concrete Masonry Units (CMU)- Cinder or Concrete Block.
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8 Series (4.0 mils wet, 1.3 mils dry per coat).

b. Gloss Finish - Early Moisture Resistant Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W Resilience Exterior Latex Gloss, K44 Series.
3) 3rd Coat: S-W Resilience Exterior Latex Gloss, K44 Series (4.0 mils wet, 1.6 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.
3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4.0-11.0 mils wet, 1.5-4.0 mils dry per coat).

d. Satin Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4.0 mils wet, 1.5 mils dry per coat).

e. Satin Finish - Early Moisture Resistant Finish:
1) 1st Coat: S-W Loxon Block Surfacer, A24W00200 (16.0 mils wet, 8.8 mils dry).
2) 2nd Coat: S-W Resilience Exterior Latex Satin, K43 Series.
3) 3rd Coat: S-W Resilience Exterior Latex Satin, K43 Series (4.0 mils wet, 1.6 mils dry per coat).

f. Flat Finish:
1) 1st Coat: S-W PrepRite Block Filler, B25W25 (75-125 sq ft/gal).
2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4.0 mils wet, 1.2

mils dry per coat).

g. Flat Finish - Early Moisture Resistant Finish:
    1) 1st Coat: S-W Loxon BlockSurfacer, A24W00200 (16.0 mils wet, 8.8 mils dry).
    2) 2nd Coat: S-W Resilience Exterior Latex Flat, K42 Series.
    3) 3rd Coat: S-W Resilience Exterior Latex Flat, K42 Series (4.0 mils wet, 1. 6 mils dry per coat).

h. High Build Coating:
    1) 1st Coat: S-W Loxon XP Waterproofing System, A24-1400 Series (14.0-18.0 mils wet; 6.4-8.3 mils dry).

2. Elastomeric System:
    a. Flat Finish:
        1) 1st Coat: S-W Loxon BlockSurfacer, A24W00200 (16.0 mils wet, 8.8 mils dry).
        2) 2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series.
        3) 3rd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series (13.0-16.0 mils wet, 6.0-7.5 mils dry per coat).
    b. Flat Finish:
        1) 1st Coat: S-W Loxon BlockSurfacer, A24W00200 (16.0 mils wet, 8.8 mils dry).
        2) 2nd Coat: S-W Sherlastic Elastomeric Coating, A5-600 Series.
        3) 3rd Coat: S-W Sherlastic Elastomeric Coating, A5-600 Series (10.0-14.0 mils wet, 4.0-6.0 mils dry per coat).
3. Textured Elastomeric System:
    a. Textured Finish:
        1) 1st Coat: S-W Loxon BlockSurfacer, A24W00200 (16.0 mils wet, 8.8 mils dry).
        2) 2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series (13.0-16.0 mils wet, 6.0-7.5 mils dry per coat).
        3) 3rd Coat: S-W ConFlex XL Textured Elastomeric High Build Coating, A5-800 (20 mils wet, 9.4 mils dry per coat).
            a) Finish Texture: Fine.
            b) Finish Texture: Medium.
            c) Finish Texture: Extra Coarse.
4. Textured Masonry System:
    a. Textured (Water Based Finish):
        1) 1st Coat: S-W Loxon BlockSurfacer, A24W00200 (16.0 mils wet, 8.8 mils dry).
        2) 2nd Coat: S-W UltraCrete Textured Masonry Topcoat A44-800 Series (50-80 sq ft/ gal).
            a) Finish Texture: Fine.
            b) Finish Texture: Medium.
            c) Finish Texture: Extra Coarse.
    b. Textured Finish (Solvent Based):
        1) 1st Coat: S-W UltraCrete Smooth Waterproofing Masonry Coating, B46 Series (100-160 sq ft/gal).
        2) 2nd Coat: S-W UltraCrete Textured Waterproofing Masonry Coating, B46 Series (50-80 sq ft/gal).
            a) Finish Texture: Fine.
            b) Finish Texture: Medium.
            c) Finish Texture: Extra Coarse.
    c. Smooth (Water Based Finish):
        1) 1st Coat: S-W Loxon XP, A24-1400 Series.
        2) 2nd Coat: S-W Loxon XP, A24-1400 Series (14.0-18.0 mils wet; 6.4-8.3 mils dry per coat).

5. Stain System:
    a. Solid Color Waterborne Finish:
        1) 1st Coat: S-W Loxon Vertical Concrete Stain, A31 Series.
        2) 2nd Coat: S-W Loxon Vertical Concrete Stain, A31 Series (50-250 sq/ft gal).
6. Clear Water Repellant:
    a. Clear Finish:
        1) 1st Coat: S-W Loxon 7% Siloxane Water Repellant, A10T7.
        2) 2nd Coat: S-W Loxon 7% Siloxane Water Repellant, A10T7 (50-200 sq ft/ gal).

C. CONCRETE: Concrete Floors (non-vehicular), Patios, Porches, Steps and Platforms.
1. Acrylic System Water-Based:
    a. Floor Finish:
        1) 1st Coat: S-W Porch & Floor Enamel, A32-200 Series.
        2) 2nd Coat: S-W Porch & Floor Enamel, A32-200 Series (4.0 mils wet, 1.5 mils dry per coat).
    b. Floor Finish:
        1) 1st Coat: S-W Sher-Crete Flexible Concrete Waterproofer-Smooth, A5-250 Series.
        2) 2nd Coat: S-W Sher-Crete Flexible Concrete Waterproofer-Smooth, A5-250 Series (10.0-12.0 mils wet per coat).

D. METAL: Aluminum, Galvanized.
1. Latex Systems:
    a. Gloss Finish:
        1) 1st Coat: S-W A-100 Exterior Latex Gloss, A8 Series.
        2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series (4.0 mils wet, 1.3 mils dry per coat).
    b. Gloss Finish - Early Moisture Resistant Finish:
        1) 1st Coat: S-W Resilience Exterior Latex Gloss, K44 Series.
        2) 2nd Coat: S-W Resilience Exterior Latex Gloss, K44 Series (4.0 mils wet, 1.6 mils dry per coat).
    c. Semi-Gloss Finish:
        1) 1st Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.
        2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4.0-11.0 mils wet, 1.5-4.0 mils dry per coat).
    d. Satin Finish:
        1) 1st Coat: S-W A-100 Exterior Latex Satin, A82 Series.
        2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4.0 mils wet, 1.5 mils dry per coat).
    e. Satin Finish - Early Moisture Resistant Finish:
        1) 1st Coat: S-W Resilience Exterior Latex Satin, K43 Series.
        2) 2nd Coat: S-W Resilience Exterior Latex Satin, K43 Series (4.0 mils wet, 1.6 mils dry per coat).
    f. Flat Finish:
        1) 1st Coat: S-W A-100 Exterior Latex Flat, A6 Series.
        2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4.0 mils wet, 1.2 mils dry per coat).
    g. Flat Finish - Early Moisture Resistant Finish:
        1) 1st Coat: S-W Resilience Exterior Latex Flat, K42 Series.
        2) 2nd Coat: S-W Resilience Exterior Latex Flat, K42 Series (4.0 mils wet, 1.6 mils dry per coat).

E. METAL: Misc. Iron, Ornamental Iron, Structural Iron and Steel, Ferrous Metal.
1. Latex Systems:

a. Gloss Finish:
   1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
   2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series.
   3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8 Series (4.0 mils wet, 1.3 mils dry per coat).
b. Semi-Gloss Finish:
   1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0-10.0 mils wet, 1.8-3.6 mils dry).
   2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.
   3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4.0-11.0 mils wet, 1.5-4.0 mils dry per coat).

F. WOOD: Decks, Exterior including pressure treated lumber, Floors (non-Vehicular), Platforms.
1. Acrylic Water-Based Floor System:
   a. Floor Finish:
      1) 1st Coat: S-W Porch & Floor Enamel, A32-200 Series.
      2) 2nd Coat: S-W Porch & Floor Enamel, A32-200 Series (4.0 mils wet; 1.5 mils dry per coat).
2. Stain Systems:
   a. Solid Color Acrylic Latex:
      1) 1st Coat: S-W SuperDeck Exterior Waterborne Solid Color Deck Stain, SD7-Series.
      2) 2nd Coat: S-W SuperDeck Exterior Waterborne Solid Color Deck Stain, SD7-Series (200-400 sq ft/gal).
   b. Semi-Solid Color Acrylic Latex:
      1) 1st Coat: S-W SuperDeck Exterior Waterborne Semi-Solid Color Deck Stain, SD5-Series.
      2) 2nd Coat: S-W SuperDeck Exterior Waterborne Semi-Solid Color Deck Stain, SD5-Series (100-350 sq ft/gal).
   c. Semi-Transparent Stain:
      1) 1st Coat: S-W SuperDeck Exterior Waterborne Semi-Transparent Stain, SD3TSeries.
      2) 2nd Coat: S-W SuperDeck Exterior Waterborne Semi-Transparent Stain, SD3T Series (100 - 350 sq ft/gal).
   d. Clear Stain:
      1) 1st Coat: S-W SuperDeck Exterior Waterborne Clear Sealer, SD1T00100.
      2) 2nd Coat: S-W SuperDeck Exterior Waterborne Clear Sealer, SD1T00100, (150 - 300 sq ft/gal).

G. WOOD: Siding, Trim, Shutters, Sashes, Hardboard-Bare/Primed.
1. Latex Systems:
   a. Gloss Finish:
      1) 1st Coat: S-W Exterior Latex Wood Primer, B42W8041 (4.0 mils wet, 1.4 mils dry).
      2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series.
      3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8 Series (4.0 mils wet, 1.3 mils dry per coat).
   b. Gloss Finish - Early Moisture Resistant Finish:
      1) 1st Coat: S-W Exterior Latex Wood Primer, B42W8041 (4.0 mils wet, 1.4 mils dry).
      2) 2nd Coat: S-W Resilience Exterior Latex Gloss, K44 Series.
      3) 3rd Coat: S-W Resilience Exterior Latex Gloss, K44 Series (4.0 mils wet, 1.6 mils dry per coat).

c. Semi-Gloss Finish:
1) 1st Coat: S-W Exterior Latex Wood Primer, B42W8041 (4.0 mils wet, 1.4 mils dry).
2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.
3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4.0-11.0 mils wet, 1.5-4.0 mils dry per coat).

d. Satin Finish:
1) 1st Coat: S-W Exterior Latex Wood Primer, B42W8041 (4.0 mils wet, 1.4 mils dry).
2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4.0 mils wet, 1.5 mils dry per coat).

e. Satin Finish - Early Moisture Resistant Finish:
1) 1st Coat: S-W Exterior Latex Wood Primer, B42W8041 (4.0 mils wet, 1.4 mils dry).
2) 2nd Coat: S-W Resilience Exterior Latex Satin, K43 Series.
3) 3rd Coat: S-W Resilience Exterior Latex Satin, K43 Series (4.0 mils wet, 1.6 mils dry per coat).

f. Flat Finish:
1) 1st Coat: S-W Exterior Latex Wood Primer, B42W8041 (4 mils wet, 1.4 mils dry).
2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4.0 mils wet, 1.2 mils dry per coat).

g. Flat Finish - Early Moisture Resistant Finish:
1) 1st Coat: S-W Exterior Latex Wood Primer, B42W8041 (4.0 mils wet, 1.4 mils dry).
2) 2nd Coat: S-W Resilience Exterior Latex Flat, K42 Series.
3) 3rd Coat: S-W Resilience Exterior Latex Flat, K42 Series (4.0 mils wet, 1.6 mils dry per coat).

2. Stain - Water Reducible Systems:
a. Semi-Transparent:
1) 1st Coat: S-W WoodScapes Exterior Polyurethane Semi-Transparent Stain, A15T00005.
2) 2nd Coat: S-W WoodScapes Exterior Polyurethane Semi-Transparent Stain, A15T00005 (100-350 sq ft/gal).

b. Solid Color:
1) 1st Coat: S-W WoodScapes Exterior Acrylic Solid Color Stain, A15 Series.
2) 2nd Coat: S-W WoodScapes Exterior Acrylic Solid Color Stain, A15 Series (200-400 sq ft/gal).

H. ARCHITECTURAL PVC, PLASTIC, FIBERGLASS
1. Latex Systems:
a. Gloss Finish:
1) 1st Coat: S-W Extreme Bond Bonding Primer, B51W00150 (3.1 mils wet, .9 mils dry).
2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series.
3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8 Series (4.0 mils wet, 1.3 mils dry per coat).

b. Gloss Finish - Early Moisture Resistant Finish:
1) 1st Coat: S-W Extreme Bond Bonding Primer, B51W00150 (3.1mils wet, .9 mils dry).
2) 2nd Coat: S-W Resilience Exterior Latex Gloss, K44 Series.
3) 3rd Coat: S-W Resilience Exterior Latex Gloss, K44 Series (4.0 mils wet, 1.6 mils dry per coat).

c. Semi-Gloss Finish:
   1) 1st Coat: S-W Extreme Bond Bonding Primer, B51W00150 (3.1 mils wet, .9 mils dry).
   2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series.
   3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4.0-11.0 mils wet, 1.5-4.0 mils dry per coat).

d. Satin Finish:
   1) 1st Coat: S-W Extreme Bond Bonding Primer, B51W00150 (3.1 mils wet, .9 mils dry).
   2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series.
   3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4.0 mils wet, 1.5 mils dry per coat).

e. Satin Finish - Early Moisture Resistant Finish:
   1) 1st Coat: S-W Extreme Bond Bonding Primer, B51W00150 (3.1 mils wet, .9 mils dry).
   2) 2nd Coat: S-W Resilience Exterior Latex Satin, K43 Series.
   3) 3rd Coat: S-W Resilience Exterior Latex Satin, K43 Series (4.0 mils wet, 1.6 mils dry per coat).

f. Flat Finish:
   1) 1st Coat: S-W Extreme Bond Bonding Primer, B51W00150 (3.1 mils wet, .9 mils dry).
   2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series.
   3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4.0 mils wet, 1.2 mils dry per coat).

g. Flat Finish - Early Moisture Resistant Finish:
   1) 1st Coat: S-W Extreme Bond Bonding Primer, B51W00150 (3.1 mils wet, .9 mils dry).
   2) 2nd Coat: S-W Resilience Exterior Latex Flat, K42 Series.
   3) 3rd Coat: S-W Resilience Exterior Latex Flat, K42 Series (4.0 mils wet, 1. 6 mils dry per coat).

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

3.2 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
   1. Prior to attempting to remove mildew, it is recommended to test any cleaner on a small, inconspicuous area prior to use. Bleach and bleaching type cleaners may damage or discolor existing paint films. Bleach alternative cleaning solutions are advised.
   2. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry before painting. Wear protective glasses or

goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.

3. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
4. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. Block (Cinder and Concrete): Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75 degrees F (24 degrees C). The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.

D. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

E. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments.

F. Copper and Stainless Steel: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP 2, Hand Tool Cleaning.

G. Exterior Composition Board (Hardboard): Some composition boards may exude a waxy material that must be removed with a solvent prior to coating. Whether factory primed or unprimed, exterior composition board siding (hardboard) must be cleaned thoroughly and primed with an alkyd primer.

H. Drywall - Exterior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting. Exterior surfaces must be spackled with exterior grade compounds.

I. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

J. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP16 is necessary to remove these treatments.

K. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting, unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

L. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.
   1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
   2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
   3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
   4. White Metal Blast Cleaning, SSPC-SP5 or NACE 1: A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
   5. Commercial Blast Cleaning, SSPC-SP6 or NACE 3: A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
   6. Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4: A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.
   7. Power Tool Cleaning to Bare Metal, SSPC-SP11: Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible

deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.

8. Near-White Blast Cleaning, SSPC-SP10 or NACE 2: A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
9. High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials: SSPC-SP12 or NACE 5: This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.
10. Water Blasting, SSPC-SP12/NACE No. 5: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

M. Vinyl Siding, Architectural Plastics, EIFS and Fiberglass: Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint vinyl siding with any color darker than the original color, unless the paint system features Sherwin-Williams VinylSafe technology. Painting with darker colors that are not Sherwin-Williams VinylSafe may cause siding to warp. Follow all painting guidelines of the vinyl manufacturer when painting. Only paint properly installed vinyl siding. Deviating from the manufacturer's painting guidelines may cause the warranty to be voided.

N. Stucco: Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments such as Loxon.

O. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION

SECTION 09 91 00

PAINTING

1. GENERAL

The work in this Section shall be performed in accordance with the General Conditions of the Contract, which are made a part hereof by reference.

2. SCOPE OF THE WORK

Includes the painting work of all the building exteriors sufaces; exterior doors; windows; electrical sub-stations and other elements specified herein. It is the intention to describe all painting work required, with the exception of the excluded work indicated below, and the Contractor shall so execute all required painting work, regardless of whether such work may be indicated on the drawings or schedule of finishes.

3. SUBMITTALS

a. .Submit for preliminary approval of the Architect samples of all colors, and sample panels of metal and wood finishes made on materials of the same kind as those used in the building.

b. After preliminary approval of samples and colors, prepare ten (10) 5’x5’ sample panels on the actual surfaces at the building in the areas where work is to be done and obtain Architect's final approval before proceeding with work.

c. All work shall be executed in strict accordance with approved sample panels.

4. PRODUCT DELIVERY, HANDLING AND STORAGE

Materials shall be delivered to the job site in unopened containers which shall show the designated name, formula or specifications, color, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at time of use. Pigmented paints shall be furnished in containers not larger than 5 gallons. Materials listed in the painting schedule without reference to a particular product and not further described hereinafter shall be products which have had a minimum of two (2) years satisfactory field service. Laboratory tests simulating field conditions will not be accepted in lieu of actual fields results.

All materials used on the job shall be stored in a single place as designed. Such storage place shall be kept clean and all damage to it or its surroundings shall be repaired. Any oily rags, waste, etc., must be removed from the building every night and every precaution taken to avoid the danger of fire.

5. MATERIALS

a. All paints shall be equal or similar to the top of the line quality of Glidden Mnfg. Co.

1) Exterior cement plasteres surfaces shall receive one coat of Glid Seal Waterproofing Sealer No. 19528/29 - spray applied and two (2) finish coats of Spread Ultra Exterior Flat Latex House & Trim Paint No. 65XX. Primer shall have a dry mil thickness of 4. Finish shall have a dry mil thickness of 8.

2) Exterior hollow metal doors, frames, trim, exposed structural steel and miscellaneous metal paint shall receive two coats of Devguard Alkyd Industrial Enamel No. 4308-XXXX. Finish shall have a dry mil thickness of 4.

3) Interior and Exterior galvanized surfaces shall receive one primer coat of Devguard Alkyd All Purpose Metal No. 4120-1000 and two coats of Devguard Alkyd Industrial Enamel No. 4308-XXXX Primer to have a dry mil thickness of 2 and finish to have a dry mil thickness of 4.

4) Interior and Exterior ferrous metal surfaces shall receive one primer coat of Devguard Alkyd Metal No. 4100-7100 and two coats of Devguard Alkyd Industrial Enamel No. 4308-XXXX Primer to have a dry mil thickness of 2 and finish to have a dry mil thickness of 4.

5) Fillers, sealers, primers and undercoaters - shall be as recommended for optimum results by the manufacturer of the paint used.

b. The above list is intended to present a general idea of the materials required, but is not to be interpreted as necessarily complete or exact. Before proceeding with the painting work the Contractor shall prepare and submit for approval by the Architect, a paint schedule showing the paints he proposes to use in each area to be finished. No painting work shall be done until this schedule has been finally approved.

c. Primers and undercoats shall be by the same manufacturer as the finish coat, and as approval.

d. Color pigments shall be color stable to sunlight and atmosphere, finely ground.

6. EXECUTION

a. Before starting any work, surfaces to receive paint finishes shall be examined carefully for defects which cannot be corrected by the procedures specified herein and which might prevent satisfactory painting results. Work shall not proceed until such damages are corrected. The commencing of work in a specific area shall be construed as acceptace of the surfaces, and thereafter the Contractor shall be fully responsible for satisfactory work as required herein.

b. Before painting is started in any area, broom clean and remove excessive dust.

c. After painting operation begin in a given area, broom cleaning will not be allowed; cleaning shall then be done only with commercial vacuum cleaning equipments

d. Adequate illumination shall be provided in all areas where painting operations are in progress.

e. Only skilled workers shall be employed. Application may be by brush, roller or spray, as approved by owner and the architect.

f. Remove and protect hardware, accessories, device plates, lighting fixtures, factory finished work, and similar items, or provide ample in-place protection. Upon completion of each space, carefully replace all removed item.

g. Remove electrical panel box cover and doors before painting walls. Paint separately and reinstall after all paint is dry.

h. All materials shall be evenly spread and flowed-on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

i. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the owner.

j. All coats shall be dry to manufacturer's recommendations before applying succeeding coats.

k. All suction spots or "hot spots" in plaster and/or cement after the application of the first coat shall be touched up before +

7. PREPARATION OF SURFACES

a. General

1) Surfaces shall be clean, dry and adequately protected from dampness.

2) All plastered surfaces shall be waterblasted @ 3000 PSI .

3) Surface shall be free of any foreign materials which will adversely affect adhesion or appearance of applied coating.

4) Mildew shall be removed and the surface neutralized per the coating manufacturer's recommendations.

5) Efflorescence on any area will be corrected before painting.

b. Concrete, Masonry and Stucco

1) Patch large openings and holes and finish flush with adjacent surface. After priming, fill any remaining small holes with prepared patching material.

2) Patch small openings with Anvil Elastomeric Textured No. 1214#1215 No. 12414/12415

3) Following manufacturers recommendations, patch loose cement plasters with Thorite Patching Material No. 14013

4) Masonry and concrete surface shall be cleaned until free of all loose and foreign materials and excess mortar, using metal scrapers and wire brushes if necessary. Grease and oil spots shall be removed by suitable cleaning compound and then rinsed with clean water to remove all traces of Alkali. Efflorescence (Alkali salts) shall be removed by washing with a 5 to 10 per cent solution of muriatic acid. Allowed to stand unit effervescing ceases, then rinsing with clear water to remove all traces of acid. Treated surfaces shall be allowed to dry throughly before any oil base paint is applied. Concrete surfaces shall be washed with zinc. sulphate solution.

c. Ferrous Metal Surfaces

1) Remove dirt and grease with Thinner Low Odor No. 38121-90 and wipe dry with clean cloths.

2) Remove rust, mill scale and defective paint down to sound surfaces or bare metal using scraper, sandpaper or wire brush as necessary. Grind, disc sand, etc., if necessary to remove shoulders at edge of sound paint to prevent them from photographing through finish coats.

3) Touch up all bare metal and damaged shop coats with specified shop coat primer.

4) For ferrous surfaces with shop coats touched up, as above required, the first coat as listed in the following schedule will be applied to the dry mil film thickness specified.

d. Galvanized Metal Surfaces

1) Remove dirt and grease with Thinner Low Odor No. 38121-90 and wipe dry with clean cloths.

e. Wood to be Painted

1) Sandpaper to a smooth and even surface, then dust off.

2) Apply shellac, four (4) pounds cut, to all knots, pitch and resinous sapwood prior to application of specified primer coats.

3) After priming coat has dried, putty all nail holes, cracks, open joints and other defects. Putty shall be colored to match primer; if putty is not compatible with finish, spot prime puttied areas.

f. Existing Surfaces to be Repainted

Where existing work is cut, patched, or added to, all surfaces shall be painted or touched up to match present work as closely as possible. Existing work, where scheduled for repainting, shall be put in condition to provide good adhesion and to receive paint.

g. Aluminum shall be cleaned with a weak solution of phosphoric acid solution containing suitable degreasing compound then rinsed with clean water and allowed to dry before bituminous protective paint is applied.

9. COATING

a. Unless otherwise specifically so directed in writting by the architect, all paints and finishes shall be applied in strict accordance with manufacturer's printed instructions.

b. All wood surfaces, except those to receive natural finish, and millwork shall receive one (1) coat enamel primer, as recommended by manufacturer and two (2) finish coat semi-gloss enamel.

c. All wood doors and bases shall receive mahogany oil stain and one (1) coat clear matte laquer.

d. All paints shall be applied to the dry and wet mil thickness as recommended by the paint manufacturer and/or specified herein.

8. WORKMANSHIP

Each coat of paint and enamel shall be evently worked out and allowed to become dry before any subsequent coat is applied or rubbing done, and shall be a different tint from that of the preceeding coat. Finish coatts shall be the exact shades selected. The finished work shall be free from runs and sags, detective coverage and clogging of lines and angles. Edges of paint adjoining other material or other colors shall be full and clean-cut without overlapping.

9. CLEAN UP

a. Upon termination of painting work the Contractor shall remove all masking materials, tools, scaffolding surplus materials from the premises and leave area clean for the work of other trades or for the uses intended.

b. Contractor should clean off all misplaced paint, spots and spills.

END OF SECTION

SECTION 09 94 10

FIELD PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Furnish and apply required paints and coatings. Prepare, clean, and finish all surfaces specified, scheduled or otherwise indicated to be field painted.

1. The terms "paint" and "coating" used herein include emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether used as intermediate, or finish coats.

B. Complete painting in accordance with Specifications, and paint manufacturer's current surface preparation and application instructions.

1.02 RELATED WORK:

A. Manufacturer's standard prime paint finishes are specified under the applicable Sections for Architectural.

1.03 SUBMITTALS:

A. To aid in determining coating compatibility, submit following:

1. List of coating products proposed, giving brand, type and manufacturer.

2. Manufacturer's current printed recommendations and product data sheets for each.

3. Field painting applicator's correspondence for determining compatibility of field coatings with primers and for selecting manufacturer producing field coats.

B. Submit color chips of materials proposed, and sample panels of paints and coatings selected. Make samples not less than 12-in. square, on sheet metal for metal coatings, on cement asbestos board for masonry and concrete coatings.

C. Submit Manufacturer's certificates and test reports for the following materials:

1. List materials

1.05 PAINT STORAGE AND MIXING AREAS, AND WASTE DISPOSAL:

A. Store paints and painter's materials only in area or areas designated solely for this purpose. Confine mixing, thinning, clean-up and associated operations, and storage of painting debris before authorized disposal, to these areas.

B. Do not use plumbing fixtures, piping or mechanical equipment for mixing or disposal of paint materials.

1. Transport water to paint area by approved temporary hose or piping.

2. Store waste temporarily in closed, nonflammable containers until final disposal. Keep no rubbish in painter's area longer than 24 hours. Finally dispose of waste in an approved disposal system outside of buildings.

1.06 DELIVERY, HANDLING, STORAGE, PROTECTION:

A. Deliver materials to painter's area in original, unbroken, containers with name and analysis of product, manufacturer's name, and shelf life date. Do not use or retain contaminated, outdated, prematurely opened, or diluted materials.

B. Store coated items carefully. Avoid damaging or dirtying coatings, by contact with soil, pavement or other harmful contacts which might necessitate special cleaning. Use suitable blocking during storage.

C. Do not expose primed surfaces to weather for more than six months before top coating. Allow less open time if recommended by coating manufacturer.

D. During surface preparation, cleaning and painting operations, protect all surfaces not to be painted.

E. Protect coated items, whether prime or finish, from damage due to shipping and handling. For items with type E or S service coatings; use padding, blocking, fabric slings and extra care.

F. Upon completion of field painting, ensure coatings undamaged and in good condition. Make good damage or coating deterioration resulting from failure to observe foregoing requirements.

1.07 JOB CONDITIONS:

A. Environmental Requirements:

1. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.

2. Do not apply coatings when dust is being generated.

B. Protection:

1. Cover or otherwise protect finish work of other trades and surfaces not being painted concurrently or not to be painted.

PART 2 - PRODUCTS

2.01 MATERIALS; GENERAL:

A. Paint Coatings: Suitable for intended use, recommended by their manufacturer for intended service.

B. Products Used: Minimum of five years satisfactory use under similar service conditions.

C. Use products of one manufacturer in any one paint coating system; all coating materials compatible. Coatings for touch-up; same as original.

2.02 COLORS AND FINISHES:

A. All finish colors as selected from manufacturer's color chips. Color schedule will indicate colors to be used. Match final colors to selected color chips, as scheduled.

C. To provide contrast between successive coats, lightly tint each coat to distinguish it from preceding coats.

D. Unless otherwise indicated, for finish paint use gloss or semigloss on wood and metal, and matte finish or flat on masonry and concrete.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work.

B. Do not proceed with surface preparation or coating application until conditions are suitable.

3.02 PREPARATION:

A. Basic Steps:

1. Coordinate cleaning and painting operations to eliminate contamination of one by the other.

2. Maintain all coating materials at manufacturer's recommended mixing and application temperatures for not less than 24 hours before use. Have clean, proper containers, spray equipment, applicators and accessory items ready for use before decanting or mixing paint materials.

3. Ensure proper coordination of materials to be applied hereunder with previous coatings on affected surfaces. Have all manufacturer's written directions on hand, and follow them strictly, except where otherwise specified.

4. Carefully coordinate preparation and material compatibility requirements with the work under Section 09940.

B. PAINT REMOVAL:

1. Coordinate cleaning and painting operations to eliminate contamination of one by the other.

2. Paint must be removed from cracked finishes before surface preparation. Removal methods are limited to:
   - Scrapping
   - vapor removal
   - heat gun removal

C. Before any paint application, carefully clean all surfaces to be coated of dust, dirt, grease, loose rust, mill scale, paint unsuitable for top coating, efflorescence, oil, moisture, foreign matter or conditions detrimental to coating bond and durability.

1. Following cleaning, apply preparatory treatment in strict accordance with manufacturer's written instructions.

2. Fill imperfections and holes in surfaces to be painted.

3.03 TOUCH-UP:

A. Before applying field coat, touch-up abraded areas of shop coats with paint of the same type. Apply an entire coat if necessary. Touch-up coats are in addition to, and not a substitute for first field coat. Clean deteriorated surfaces to bare wood before applying touch-up coat.

3.04 APPLICATION:

A. In general, apply minimum of one under coat and one finish coat to all previously primed surfaces. Following careful inspection of surfaces not previously primed, prepare and clean as specified, apply proper prime coat and minimum of one under coat and one finish coat. Refer to Paint Schedule at end of section.

B. Conditions:

1. Do not apply paints or other finish to wet or damp surfaces, except in accordance with instructions of manufacturer. Do not apply exterior paint during cold, rainy, or frosty weather, or when temperature is likely to drop to freezing. Avoid painting of surfaces while they are exposed to the sun.

2. Paint surfaces which have been cleaned, pretreated, or otherwise prepared for painting with first field coat as soon as practicable after such preparation has been completed, but in any event prior to deterioration of prepared surface.

C. Methods:

1. Spraying with adequate apparatus may be substituted for brush application of suitable paints and in locations suitable for spraying.

2. Prepare surfaces, mix and apply paint materials in strict accordance with manufacturer's printed instructions and recommendations, except where specifically directed otherwise. Control temperature of materials upon mixing and application, surface temperature and condition, thinning and modifying.

3. Protect surfaces to be coated, before, during and after application unless ambient weather conditions are favorable.

D. Workmanship:

1. Spot prime with aluminum paints, all exposed nails and other ferrous metal on surfaces to be painted with water-thinned paints.

2. Apply coating materials to meet manufacturer's spreading rate and dry film thickness recommendations. Dry film thickness specified are constant for brush, spray, roller or other form of application.

a. Control thinning for spray use and to manufacturer's printed instructions, and produce specified dry film thickness on level surfaces, interior and exterior angle

b. Record quantities of materials of each type, for each coat, used in each location.

3. Apply paints and coatings using skilled painters, brushed or rolled out carefully to a smooth, even coating without runs or sags. Flow enamel on evenly and smoothly. Allow each coat of paint to dry thoroughly, on the surface and throughout the film thickness, before the next coat is applied. High polymer coatings may be excepted from the drying requirement if recoat time is specified by manufacturer.

4. Finish surfaces: Uniform in finishes and colors, and free from flash spots and brush marks.

5. Accessory items, finish hardware, lighting fixtures, escutcheons, plates, trim and similar finish items not to be painted: Remove or carefully mask before painting adjacent surfaces. Carefully replace and reposition upon completion of adjacent painting and cleaning work.

3.05 PROTECTION, CLEAN-UP:

A. Protect all materials and surfaces painted or coated under this section, both before and after application. Also protect all adjacent work and materials by the use of sufficient drop cloths during the progress of this work. Upon completion of the work, clean up all paint spots, oil, and stains from floors, glass, hardware, and similar finished items.

3.06 PAINT SCHEDULE:

A. Coordinate, schedule and confirm the various cleaning, touch-up and finishing operations. Ensure the transmission of materials data, color selections and coating system methods between the coating applicators. Take responsibility for not exceeding exposure and recoat time limits.

3.07 FINAL TOUCH-UP:

A. Prior to final completion and acceptance, examine painted and finished surfaces and retouch or refinish as necessary and required to leave surfaces in perfect condition.

B. After doors have been fitted and hung, refinish edges, tops and bottom.

END OF SECTION

DIVISION 10 – EXTERIOR – GRILLES - SCREENS

SECTION 10 82 13
EXTERIOR GRILLES AND SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expanded Metal Window Grills.

B. Perforated Steel Grills.

1.02 QUALITY ASSURANCE

A. Where windows are indicated or required for proper egress. Provide assemblies that comply with NFPA 101 sec. 5-2.1.7.2 for push or pull type exit devices.

B. All grills shall qualify as a HUD “HEAVY’ (level 5) as certified by NAMI or similar testing agencies. At a minimum they shall met the following standard tests:

1. Impact Test: Resist 100 foot-pounds of force without stretching the grill material more than 3” and without tearing the grill fabric at any point.
2. Forced Entry Test: Resist prying load of 150 pounds and simultaneous pulling load of 300 pounds without springing the lock or bending the frame. This requirement is subject to review and approval by the Denver Fire Department.
3. Sag Test: Resist 90 pounds of weight on the open grill with no more than a .063” sag in the grill.

1.03 SUBMITTALS

A. Submit product literature and test results to the Architect.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide exterior window grills as manufactured by one of the following:

1. Avant Guards, Inc.
2. Kane Manufacturing Corp.

2.02 FABRICATION

A. Welding shall comply with the requirements of AWS. Grind welds smooth.

B. Window grills, unless otherwise noted by DPS, shall cover the entire window opening.

C. Where hinged grills cannot be opened due to obstructions, provide removable sections.

D. Unless otherwise noted by DPS, provide windows at roof levels with hinged grills at lower sash.

2.03 MATERIALS

A. Frames:

1. Galvanized Steel 10 gauges (12-gauge subframe).
2. Extruded Aluminum 10 gauge (12 gauge subframe).
3. Hot Rolled Steel 10 gauge (12 gauge subframe), ASTM A36.
4. Cold Rolled Steel 10 gauge (12 gauge subframe), ASTM A611, Grade C.
5. Wrought Iron 10 gauge (12 gauge subframe). B. Grills:

1. Expanded Perforated Steel, Various Patterns.

a) Standard: 16 gauge galvannealed metal having 63% open area with 5/32" holes on 3/16" stagger centers, and shall comply with ASTM A568.

2. Steel Wire Mesh – Diamond or Square, 3/8" clear opening is

maximum. C. Connections shall be:

1. Galvanized Steel Bolts.
2. Stainless Steel Bolts.

D. All components shall be isolated from dissimilar metals as recommended by the grill manufacturer and as approved by the architect.

E. Hinges: A minimum of 2 heavy duty hinges shall be provide for a 4 foot long grill and a minimum of 4 for an 8 foot long grill, or as otherwise approved in writing by DPS.

END OF SECTION 10 82 13

DIVISION 15 – MECHANICAL

SECTION 15 41 10
WATER DISTRIBUTION PIPING

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 water distribution piping from locations indicated to fixtures and equipment inside building.

1.3 DEFINITIONS

A. Water Service Piping: Water piping outside building that conveys water to building.

B. Service Entrance Piping: Water piping at entry into building between water service piping and water distribution piping.

C. Water Distribution Piping: Water piping inside building that conveys water to fixtures and equipment throughout the building.

D. The following are industry abbreviations for plastic piping materials:

1. CPVC: Chlorinated polyvinyl chloride.
2. NP: Nylon.
3. PB: Polybutylene.
4. PE: Polyethylene.
5. PP: Polypropylene.
6. PVC: Polyvinyl chloride.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

. Service Entrance Piping: 160 psig.
2. Water Distribution Piping: 125 psig.

1.5 SUBMITTALS

A. Water Samples, Test Results, and Reports: Specified in "Field Quality Control" and "Cleaning" articles.

1.6 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-

water piping components. Include marking "NSF-pw" on plastic potable-water piping.

D. Comply with NSF 61, "Drinking Water System Components--Health Effects," Sections 1 through 9 for potable-water piping and components.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

C. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

D. PVC Plastic Pipe: ASTM D 1785, Schedules 40 and 80.

E. PVC Plastic Pipe: AWWA C900, Classes 150 and 200; with bell end with gasket, and spigot end.

2.2 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Copper, Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper.

C. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

E. Copper Unions: ASME B16.18, cast-copper-alloy, hexagonal-stock body with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Include threads conforming to ASME B1.20.1 on threaded ends.

F. Schedule 80, PVC Socket Fittings: ASTM D 2467.

G. Schedule 40, PVC Socket Fittings: ASTM D 2466.

H. PVC Gasketed Fittings: AWWA C907, Class 150; with gaskets.

2.3 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for commonly used joining materials.

C. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.

D. Brazing Filler Metal: AWS A5.8, BCuP, copper phosphorus or BAg, silver classification.

E. Copper, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

F. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

2.4 VALVES

A. CPVC Plastic Valves: CPVC plastic body material similar to CPVC plastic piping system with seats, seals, and other components suitable for potable-water service. Comply with the following:

1. Ball Valves, 3-Inch NPS and Smaller: Union type with socket or threaded ends.
2. Check Valves, 4-Inch NPS and Smaller: Ball type with socket ends.

B. PVC Plastic Valves: PVC plastic body material with seats, seals, and other components suitable for potable-water service. Comply with the following:

1. Ball Valves: Union type with socket or threaded ends.
2. Check Valves, 2-Inch NPS and Smaller: Diaphragm or ball type with threaded or socket ends.
3. Check Valves, 3-Inch NPS and Larger: Swing or ball type with flanged ends.

C. PVC Plastic Valves: PVC plastic body material similar to PVC plastic piping system with seats, seals, and other components suitable for non-potable-water service. Comply with the following:

1. Ball Valves: Union type with socket or threaded ends.
2. Check Valves, 2-Inch NPS and Smaller: Diaphragm or ball type with threaded ends.
3. Check Valves, 3-Inch NPS and Larger: Swing or ball type with flanged ends.
4. Gate Valves: Nonrising-stem type with flanged ends.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.
C. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.

D. Underground, Service Entrance Piping: Do not use flanges or valves underground. Use the following:

1. 2-Inch NPS and Smaller: Soft copper tube, Type K; copper, solder-joint pressure fittings; and soldered joints.
2. 2-1/2- to 3-1/2-Inch NPS: Soft copper tube, Type K; copper, solder-joint pressure fittings; and soldered joints.
3. 4- to 8-Inch NPS: Ductile-iron pipe and fittings, and mechanical or push-on joints.
4. 10- and 12-Inch NPS: Ductile-iron pipe and fittings, and mechanical or push-on joints.

E. Aboveground, Water Distribution Piping: Use the following:

1. 1-1/2-Inch NPS and Smaller: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
2. 2-Inch NPS: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
3. 2-1/2- to 3-1/2-Inch NPS: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
4. 4- to 6-Inch NPS: Hard copper tube, Type L with grooved ends; copper, grooved-end fittings; and copper, keyed couplings.
5. 4- to 6-Inch NPS: Flanged, ductile-iron pipe and flanged, ductile-iron fittings.
6. 4- to 6-Inch NPS: Ductile-iron pipe and fittings with grooved ends and ductile-iron, keyed couplings.
7. 8-Inch NPS: Flanged, ductile-iron pipe and flanged, ductile-iron fittings.
8. 10- and 12-Inch NPS: Flanged, ductile-iron pipe and flanged, ductile-iron fittings.

F. Underground, Water Distribution Piping: Do not use flanges or valves underground. Use the following:

1. 2-Inch NPS and Smaller: Hard copper tube, Type L; wrought-copper, solder-joint pressure fittings; and soldered joints.
2. 2-1/2- to 4-Inch NPS: Hard copper tube, Type L; wrought-copper, solder-joint pressure fittings; and soldered joints.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use gate, ball, or butterfly valves.
2. Throttling Duty: Use globe, ball, or butterfly valves.

B. Grooved-end butterfly valves may be used with grooved-end piping.

C. Plastic gate, globe, ball, butterfly, and check valves may be used with plastic piping.

3.4 PIPING INSTALLATION, GENERAL

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

3.5 SERVICE ENTRANCE PIPING INSTALLATION

A. Extend service entrance piping to exterior water service piping in sizes and locations indicated for service entrances into building. Refer to Division 2 Section "Water Systems" for water service piping.

B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each service entrance pipe.

C. Ductile-Iron, Service Entrance Piping: Comply with AWWA C600. Install buried piping between shutoff valve and connection to water service piping with restrained joints. Anchor pipe to wall or floor at entrance. Include thrust-block supports at vertical and horizontal offsets.

1. Encase piping with polyethylene film according to ASTM A 674 or AWWA C105.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service entrance

pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

E. Install wall penetration system at each service entrance pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.

3.6 WATER DISTRIBUTION PIPING INSTALLATION

A. Install piping with 0.25 percent slope downward toward drain.

B. Install piping level without pitch.

C. Fitting Option for Hard Copper Tube: Mechanically formed tee-branch outlets may be used instead of tee fittings.

3.7 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube, drill pilot hole, form collar for outlet, dimple tube forming seating stop, and braze branch tube into collar.

C. Grooved Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

D. Solvent-Cemented, Thermoplastic Pipe and Fitting Joints: Handle cleaners, primers, and solvent cements according to ASTM F 402.

3.8 VALVE INSTALLATION

A. Sectional Valves: Install sectional valves close to main on each branch and riser serving plumbing fixtures or equipment, and where indicated. Use gate or ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.

B. Shutoff Valves: Install shutoff valve on each water supply to equipment, on each supply to plumbing fixtures without supply stops, and where indicated. Use gate or ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.

C. Drain Valves: Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

D. Balancing Valves: Install in each hot-water circulation return branch, discharge side of each pump and circulator, and where indicated. Use ball valve for piping 2-inch NPS and smaller and butterfly valve for piping 2-1/2-inch NPS and larger. Refer to Division 15 Section "Plumbing Specialties" for balancing valves.

E. Calibrated Balancing Valves: Install in each hot-water circulation return branch, discharge side of each pump and circulator, and where indicated. Refer to Division 15 Section "Plumbing Specialties" for calibrated balancing valves.

3.9 HANGER AND SUPPORT INSTALLATION

A. Install supports according to Division 15 Section "Hangers and Supports."

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

D. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:

1. 3/4-Inch NPS and Smaller: Maximum horizontal spacing, 60 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
2. 1-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
3. 1-1/4-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
4. 1-1/2 and 2-Inch NPS: Maximum horizontal spacing, 96 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
5. 2-1/2-Inch NPS: Maximum horizontal spacing, 108 inches with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
6. 3-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
7. 3-1/2-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
8. 4- and 5-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
9. 6-Inch NPS: Maximum horizontal spacing, 10 feet with 5/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
10. 8-Inch NPS: Maximum horizontal spacing, 10 feet with 3/4-inch minimum rod diameter; maximum vertical spacing, 10 feet.

E. Install hangers for PVC plastic piping with the following maximum spacing and minimum rod diameters:

1. 2-Inch NPS and Smaller: Maximum horizontal spacing, 48 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.
2. 2-1/2- to 3-1/2-Inch NPS: Maximum horizontal spacing, 48 inches with 1/2-inch minimum rod diameter; maximum vertical spacing, 48 inches.
3. 4- and 5-Inch NPS: Maximum horizontal spacing, 48 inches with 5/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.
4. 6-Inch NPS: Maximum horizontal spacing, 48 inches with 3/4-inch minimum rod diameter; maximum vertical spacing, 48 inches.
5. 8-Inch NPS: Maximum horizontal spacing, 48 inches with 7/8-inch minimum rod diameter; maximum vertical spacing, 48 inches.

F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

A. Connect service entrance piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.

B. Connect water distribution piping to service entrance piping at shutoff valve, and extend to and connect to the following:

1. Booster Systems: Connect cold-water suction and discharge piping.
2. Water Heaters: Connect cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Connect hot- and cold-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
4. Equipment: Connect hot- and cold-water supply piping as indicated. Provide shutoff valve and union for each connection. Use flanges instead of unions for connections 2-1/2-inch NPS and larger.

3.11 FIELD QUALITY CONTROL

A. Inspect water distribution piping as follows:

B. Inspect service entrance piping and water distribution piping as follows:
1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

    a. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Test water distribution piping as follows:

D. Test service entrance piping and water distribution piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.12 CLEANING

A. Clean and disinfect potable-water distribution piping as follows:

B. Clean and disinfect potable service entrance piping and water distribution piping as follows:

C. Clean and disinfect water distribution piping as follows:

D. Clean and disinfect service entrance piping and water distribution piping as follows:

1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for 3 hours.

    c. Flush system with clean, potable water until chlorine is no longer in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows contamination.

E. Prepare and submit reports for purging and disinfecting activities.

F. Clean interior of piping system. Remove dirt and debris as work progresses.

3.13 COMMISSIONING

A. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

B. Perform the following steps before putting into operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.

C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

D. Check plumbing specialties and verify proper settings, adjustments, and operation.

1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.

E. Energize pumps and verify proper operation.

END OF SECTION 15 41 10

DIVISION 22 PLUMBING

Section 22 42 00 – Commercial Plumbing Fixtures

PART 1: GENERAL

A. The design guidelines contained herein include the requirements for plumbing fixtures at Texas State University and is not intended to be a guide specification.

B. Work Included: Provide water conserving plumbing fixtures, trim, and accessories specified. Fixtures shall be complete with carriers, trim brass, flush valves, seats, stops, and other required accessories as specified herein or required. Trim for all sinks, lavatories, urinals, water closets, and showers shall comply with applicable water conservation standards. Refer to Construction Standard 1-03_ Codes-Rules-Laws and Requirements which govern this section.

PART 2: PRODUCTS

2.01 Acceptable Standard

Manufacturers: A. FIXTURES:

1. Lavatory: wall hung, vitreous china lavatory, with rectangular basin, splash lip, front overflow, fabricated for concealed arm supports, and having two soap depressions. Drill lavatories for 4” center faucets. Provide concealed arm carriers, trap, and supplies and stops.

   Basis-of-Design: Manufacturer-Kohler Company, model K-2032.

   Note: Lavatory Intragal to Solid Polymen Counter Top are approved.

2. Lavatory: undercounter mounted, 19” x15” oval shaped, white vitreous china fixture, support clips for under counter mounting.

   Basis-of-Design: Manufacturer-Kohler Company, model K-2211.

3. Water Closets: Public Buildings: Low Consumption, vitreous china, floor outlet, floor mounted, water saving, siphon jet elongated closet bowl, with 1-1/2” top spud; quiet flushing action, with self-draining jets and large passageway. Provide carriers, seat, and flush valve as specified in the Articles below.

   Basis-of-Design: Water Closets (non-ADA compliant), Manufacturer- Kohler Company, model K-96053, 1.28 gpf, Elongated, white color.

   Basis-of-Design: ADA Compliant Water Closets, manufacturer-Kohler

   Company, model #K-96057, 1.28 gpf, white color.

   CAMPUS HOUSING - BASIS of DESIGN; Tank Type Water Closet. Manufacturer-Kohler Company, model K3422 elongated, white color.

4. Urinals: Wall hung, back outlet, washout, accessible where indicate on drawings.

   Basis–of-Design: Manufacturer—Kohler Company, model #K5016-ET-0, 0.5 gpf, (ADA compliant), and white color.

a. Provide required number of ADA urinals and locate at ADA mounting height.

b. Provide clean-outs at each urinal, minimum of 6” above the flood-level rim of the fixture with cover to chromed plated (cover to be chromed plated). Approved manufacturer – MIFAB Series C11660-RD. B. FAUCETS:

1. Public Buildings: ADA compliant, Self – closing type, 4” center only, chrome plated cast brass, cold water only is standard.

   Basis-of - Design: (cold water) Manufacturer – Chicago Faucet, model 857-665PSHAB.

   Basis-of -Design: (hot water) Manufacturer – Chicago Faucet, model 802-V665cp.

   Approved Hot and Cold Water Metering Lavatory Faucet – Chicago Model #802-V665ABCP.

   CAMPUS HOUSING – BASIS of DESIGN: ADA compliant, manual operated, 4” center only, chrome plated brass cast, 4” spout with constant flow aerator, single-wing handles indexed “HOT” and “COLD” and 1¼” chrome plated pop-up waste. Manufacturer – Delta, model 525 MPLI

2. Shower Faucet - ADA Compliant

   Basis – of – Design: Manufacturer – Delta 1343 WS

   a. Provide built in shut off stops, washerless, mixer type shower and tub valve with metal blade handle.

   b. Valve shall open to cold water first and then through warm with metal blade handle.

   c. Valve shall open to cold water first and then through warm (mix) to hot.

   d. Faucet shall have all operating parts separately replaceable from outside the wall, rotating cylinder type operating mechanisms, equipped with replaceable nonmetallic seats contained in stainless steel lined sockets.

   e. Valve shall be equipped with pressure balance spool and sleeve device of Type 302 stainless steel which will maintain a preset high temperature limit; check stop (with an adjustable stop to prevent the possibility of the valve being turned to full hot water).

   f. Provide with handheld shower head with swivel fitting, 60” flexible stainless steel hose, in-line vacuum breaker, and 24” chrome plated shower head slide guide set at 42” and 66” above the shower unit floor. C. FLUSHOMETER VALVES:

1. Water Closet Flush Valve: ADA compliant, battery powered, side mount sensor operated water closet flushometer.

   Basis of Design: Manufacturer – Sloan Valve Company, Royal Optima SMO, model 111-1.28 HET Flush Valve and Sensor.

2. Urinal Flush Valve: Auto Flush chrome plated, ¾" I.P.S. screwdriver operated combination angle check and stop valve with protective cap, adjustable tailpiece, vacuum breaker flush connection and spud coupling for ¾" top spud flanges.

   a. Basis- of-Design: Manufacturer - Sloan Royal 186 SMO-0.5-OR Royal Sensor

Flushometer D. FIXTURE SUPPORTS:

1. Lavatory Supports (Hollow Tile or CMU Walls): adjustable cast iron, with thin concealed arms and sleeves, and complete with escutcheons and mounting fasteners.

2. Need to add a carrier for normal plumbing chase in walls. E. FITTINGS,

   TRIM, AND ACCESSORIES:

   1. Toilet Seats: elongated, solid white plastic closed back/open front, less cover, and having stainless steel check hinge and replaceable bumpers.

      a. Bemis Mfg. Co. Model #2L2155T 2" Lift

   2. P-Traps:

      a. Non ADA-cast brass, 1-1 ½" adjustable "P" trap, on all Lavatory and Electric Drinking Fountain, with cleanout and waste to wall. Approved manufacturer - Kohler, model K9000.

      b. ADA requirements – P-trap designed to provide knee clearance for wheelchairs, per ADA. Approved manufacturer - Kohler K-7131-A-CP.

   3. Grid Strainer – 1 ¼" offset, by Kohler, model K13885. F. DRINKING FOUNTAIN:

   1. Elkay EZH20 System, Model LZSTL8WSSP - Next Generation Water Bottle Refilling Station, BiLevel, Stainless. Alternative (where bi-level station is not required) – Elkay LZS8WSL.

   2. Elkay EZH20 System, Model LZSTL(R)8WS or LZ8WS - Cooler/Bottle Filing Station (for Residential Life use).

   3. Elkay, Model #EHFSA8L or #EZS8L, stainless steel housing.

G. HAMMER ARRESTERS

   1. Approved manufacturer – Sioux Chief HydraRester Series

H. THERMOSTATIC MIXING VALVES

   1. Approved manufacturer – HydroGuard XP Master Tempering Valves Series LFMM430.

I. FLOOR SINKS

   1. Approved manufacturer – MIFAB Series FS1740, 12" X 12" X 10" (without weepholes)

J. MOP SINKS

   1. Approved manufacturer for faucet – Chicago Faucets Model #. 305-VBRRCF

2. Approved manufacturer for basin – Stern Williams Serviceptor SB-900, 24” X 24” X 12”.

K. TRAP PRIMERS

1. Approved manufacturer for IN-WALL electronic trap primer configurations – Precision Plumbing Products Prime-Time Electronic Trap Priming Assembly FLUSH MOUNT Models PT4, PT-6, PT-8, PT-10, PT-12, PT-1320, PT-2130.

2. Approved manufacturer for EXPOSED electronic trap primer configurations – Precision Plumbing Products Prime-Time Electronic Trap Priming Assembly SURFACE MOUNT Models PTS-4, PTS-6, PTS-8, PTS-10, PTS-12, PTS-1320, PTS-2130

3. Approved manufacturer for water closet flush valve-type trap primers – Sloan Vacuum Breaker Trap Primer “TP” Variation Series VBF-72-A

4. Approved manufacturer for lavatory drain-type trap primers – Sioux Chief 200/213/206 series TrapEase trap Primer tailpiece.

PART 3: EXECUTION

3.01 Installation:

A. Install a stop valve in an accessible location in the water connection to each fixture. Ensure rough-ins of hot & cold lavatory cutoff valves do not conflict with adjacent tailpieces.

1. Approved manufacturer – Brass Craft ½” Nom Compression x 3/8” O.D. Compression Outlet ¼” turn Angle Stop.

B. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork.

1. Approved manufacturer – BrassCraft ½” Nom (5/8 in. O.D.) (.625 I.D.) Iron Pipe Shallow Escutcheon.

C. Install braided polymer supply lines for connections from angle stops to lavatory faucets.

1. Accepted manufacturer – BrassCraft 3/8” Comp x ½” FIP

D. Seal fixtures to walls and floors using silicone sealant. Match sealant color to fixture color.

3.02 Field Quality Control:

A. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning units, then retest.

END OF SECTION 22 42 00

SECTION 22 47 00 - DRINKING FOUNTAINS AND WATER COOLERS

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. Drinking fountains.
   2. Pressure water coolers.
   3. Bottle water coolers.
   4. Fixture supports.

1.3 DEFINITIONS

A. Accessible /Drinking Fountain/ /and/ Water Cooler/: Fixture that can be approached and used by people with disabilities.
B. Drinking Fountain: Fixture with nozzle for delivering stream of water for drinking.
C. Fitting: Device that controls flow of water into or out of fixture.
D. Fixture: Drinking fountain or water cooler, unless one is specifically indicated.
E. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of fixture indicated.
B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
D. Maintenance Data: For fixtures to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"[; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act";] about fixtures for people with disabilities.
C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

1.6 COORDINATION

A. Coordinate roughing-in and final fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filter Cartridges: Equal to percent of amount installed for each type and size indicated, but not less than one of each.

1.8 DRINKING FOUNTAINS

A. Drinking Fountains, /Accessible,/ Style W, wall-hanging fixture made of /stainless steel/
1. Receptor Shape: /Rectangular/ .
2. Back Panel: Stainless-steel wall plate behind drinking fountain.
3. Bubblers: /One/ , with automatic stream regulator, located on deck.
4. Control: /Push button/
5. Supply: NPS 3/8 (DN 10) with ball, gate, or globe valve.
6. Drain: Grid with NPS 1-1/4 (DN 32) minimum horizontal waste and trap complying with ASME A112.18.1M.
7. Support: Type I, water-cooler carrier. Refer to "Fixture Supports" Article.

1.9 PRESSURE WATER COOLERS

A. Water Coolers, ARI 1010, Type PB, pressure with bubbler, Style F, freestanding or Style FW, flush-to-wall/
1. Available Products:
2. Products:
a. Elkay Manufacturing Co.;
b. Elkay Manufacturing Co.; CORDLEY/Temprite Div.;
c. Halsey Taylor;
d. Haws Corporation;
e. Larco, Inc.;
f. Oasis Corp.; .
g. Sunroc Corp.;

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.
B. Examine walls and floors for suitable conditions where fixtures are to be installed.

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

3.2 APPLICATIONS

A. Use carrier off-floor supports for wall-hanging fixtures, unless otherwise indicated.
B. Use mounting frames for recessed water coolers, unless otherwise indicated.
C. Set freestanding and pedestal drinking fountains on floor.
D. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.3 INSTALLATION

A. Install off-floor supports affixed to building substrate and attach wall-hanging fixtures, unless otherwise indicated.
B. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.
C. Install fixtures level and plumb.
D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Refer to Division 15 Section "Valves" for general-duty valves.
E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
F. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
G. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Connect water supplies from water distribution piping to fixtures.
C. Connect drain piping from fixtures to drainage piping.
D. Ground equipment.
    1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Water-Cooler Testing: Af3.7 ter electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.
B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.
C. Report test results in writing.

3.6 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.
B. Adjust water-cooler temperature settings.

3.7 CLEANING

A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

END OF SECTION 22 47 00

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

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. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete equipment bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. LFMC: Liquid tight flexible metal conduit.

D. RMC: Rigid Metal Conduit

1.4 SUBMITTALS

A. Product Data: For electricity-metering equipment.

B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. EMT: ANSI C80.3, zinc-coated steel, with set-screw or compression fittings.

B. FMC: Zinc-coated steel.

C. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.

D. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.

E. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.

F. Raceway Fittings: Specifically designed for the raceway type with which used.

2.2 CONDUCTORS

A. Conductors, No. 10 AWG and Smaller: Stranded copper.

B. Conductors, Larger Than No. 10 AWG: Stranded copper.

C. Insulation: Thermoplastic, rated at 75 deg C minimum.

D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.3 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.

D. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (203 mm) o.c., in at least one surface.

1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.

F. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

H. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

I. Expansion Anchors: Carbon-steel wedge or sleeve type.

J. Toggle Bolts: All-steel springhead type.

K. Powder-Driven Threaded Studs: Heat-treated steel.

2.4 ELECTRICAL IDENTIFICATION

A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.

1. Type: Pretensioned, wraparound plastic sleeves. Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.
2. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
3. Color: Black letters on orange background.
4. Legend: Indicates voltage.

C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick (25 mm wide by 0.08 mm thick).

D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:

1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend that indicates type of underground line.

E. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

G. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch (1.6-mm) minimum thickness for signs up to 20 sq. in. (129 sq. cm) and 1/8-inch (3.2-mm) minimum thickness for larger sizes. Engraved legend in black letters on white background.

H. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.

I. Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm), galvanized-steel backing, with colors, legend, and size appropriate to the application. 1/4-inch (6-mm) grommets in corners for mounting.

J. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.5 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

B. Meter Sockets: Comply with requirements of electrical power utility company.

C. Modular Meter Centers: Factory-coordinated assembly of a main meter center circuit-breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections, complete with interconnecting buses.

1. Housing: NEMA 250, Type 3R enclosure.
2. Tenant Branch Circuit Breakers: Series combination rated to protect circuit breakers in downstream panelboards that have 22,000-A interrupting capacity, minimum.

2.6 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."

B. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

2.7 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 RACEWAY APPLICATION

A. Use the following raceways for outdoor installations:

1. Exposed: RMC.
2. Concealed: EMT.
3. Underground, Single Run: RNC
4. Underground, Grouped: RNC
5. Connection to Vibrating Equipment: LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4X.

B. Use the following raceways for indoor installations:

1. Exposed: EMT.
2. Concealed: EMT
3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
4. Damp or Wet Locations: RMC.
5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

3.3 RACEWAY AND CABLE INSTALLATION

A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

B. Install raceways and cables at least 24 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

C. Use temporary raceway caps to prevent foreign matter from entering.

D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.

F. Install raceways embedded in slabs in middle third of slab thickness where practical and leave at least 2-inch concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Install conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

H. Install telephone and signal system raceways, 2-inch trade size (DN53) and smaller, in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch (1830-mm) flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.4 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

A. Feeders: Type THHN/THWN insulated conductors in raceway.

B. Underground Feeders and Branch Circuits: Type XHHW or single-wire,

C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.

D. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.5 WIRING INSTALLATION

A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

B. Install wiring at outlets with at least 12 inches (300 mm) of slack conductor at each outlet.

C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.6 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Selection of Supports: Comply with manufacturer's written instructions.

D. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.7 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving

lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
   1. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
   2. New Concrete: Concrete inserts with machine screws and bolts.
   3. Existing Concrete: Expansion bolts.
   4. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
   5. Steel: Welded threaded studs or spring-tension clamps on steel.

      a. Field Welding: Comply with AWS D1.1.

   6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
   7. Light Steel: Sheet-metal screws.
   8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.8 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Identify raceways and cables with color banding as follows:

1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (8-m) maximum intervals in congested areas.
3. Colors: As follows:

    a. Fire Alarm System: Red.
    b. Security System: Blue and yellow.
    c. Telecommunication System: Green and yellow.

E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches (150 to 200 mm) below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm), overall, use a single line marker.

G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Black.
2. Phase B: Red.
3. Phase C: Blue.

H. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

I. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.9 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.10 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.11 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.12 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove demolished material from Project site.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.13 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.14 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Electricity-metering components.
6. Concrete bases.
7. Electrical demolition.
8. Cutting and patching for electrical construction.
9. Touchup painting.

B. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.

1. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.

2. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
3. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
4. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.15 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.16 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 26 05 00

SECTION 26 05 01

GENERAL ELECTRICAL REQUIREMENTS FOR RENOVATION AND DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general requirements for renovation and demolition of electrical systems and materials for all Campus buildings and facilities.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

A. N/A.

PART 2 - PRODUCTS

A. N/A.

PART 3 - EXECUTION

3.1 REQUIREMENTS FOR ELECTRICAL RENOVATION AND DEMOLITION

A. Comply with NFPA, and OSHA requirements, NEC-70 and -70E.

B. Protect adjacent building services and materials indicated to remain. Install and maintain barriers to keep dirt, dust and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition is completed. If infiltration of dust or dirt results due to improper barriers, Contractor shall be responsible for all maintenance and cleaning.

C. Where electrical work to remain is damaged or disturbed in the course of the work, the Contractor shall remove damaged portions and provide new products of equal capacity, quality, and functionality at his own expense.

D. Unless otherwise noted, demolish and remove existing electrical materials and equipment only to the extent required by new construction and as indicated. Removal of equipment shall not interfere with existing operations.

E. Notify Architect of discrepancies between existing conditions and the Drawings before proceeding with demolition or renovation.

F. During construction the contractor shall always maintain electrical utilities of the building without interruption. Should it be necessary to interrupt any electrical service or utility, the contractor shall secure permission in writing from the Chief Electrician for such interruption at least ten (10) business days (or two calendar weeks) in advance. Any interruption shall be made with minimum amount of inconvenience and any shut-down time shall have to be on a premium time basis and such time to be included in the contractor's bid. Arrange to provide and pay for temporary power source if required by project conditions. If requested, power may be metered. Submit drawing of proposed temporary connections for approval.

1. Services passing through areas of remodeling shall be maintained throughout the construction period.
2. Circuits serving areas adjacent to the construction area that are modified as part of a remodeling project shall be re-circuited as part of the project.

J. Provide temporary and/or modify existing emergency power, emergency lighting, fire alarm, and other services as required for construction-period Life Safety measures.

K. Contractor shall ensure that light switches within the Work area remain operational. Where temporary 120 volt light strings are installed, a switch shall be provided for the light strings near the Project entry door. Lights shall be switched off every day at the completion of the shift.

L. Turn off circuit breakers or switches serving abandoned circuits at the commencement of work and tag breaker or switch and label in panel schedule as “Spare”.

M. Remove conduit and wire back to panelboards or to nearest junction box that is not being removed and needs to remain in service. Wire shall be removed back to point of origin.

N. Conduit and Junction Boxes:

1. Conduit and boxes in existing walls to be demolished shall be removed.
2. Conduit and boxes in existing walls to remain (if not reused) shall be removed.
3. Conduit in existing or new ceilings that is not intended for reuse shall be removed back to the panel from where it originates.
4. Conduits that had been run in existing slabs shall be saw-cut off flush where they exit the slab and then be fire-sealed.

N. Conductors:

1. Conductors that are not to be reused shall be removed back to the nearest point-of-use. Where the entire circuit is to be removed, the conductors shall be removed back to the panelboard from which they originate.

O. Receptacles:

1. Remove devices that are not installed at reusable locations. Boxes shall be blanked.

P. Lighting Fixtures:

1. Lighting fixtures that cannot be reused shall be removed, including associated wiring to ceiling-mounted junction boxes.
2. Fluorescent lighting fixtures shall not be reused or relocated and shall be replaced with LED types per Section 265100 requirements.

Q. Relocation: Carefully remove, clean and restore items designated for relocation to a “like new” condition, and store them for reuse.

R. Materials and equipment to be removed, except items specifically noted to be relocated or delivered to the project, become property of the Contractor and shall be immediately removed from the Project Site and legally disposed of. If the project identifies other items during construction, those items become project property and shall be turned over to the project. All salvaged items belonging to the project shall be stored in a secure area until delivery to project as directed. Transport all such items to project designated storage area.

S. Demolished items, rubbish and debris shall be removed from the construction site daily, and at the completion of the work. Floors shall be swept clean daily. Failure to do so may result in the cleanup being performed by others and all costs thereof being deducted from the Contractor's final payment.

T. All tools and ladders shall be locked up at the end of the work every day.

END OF SECTION 26 05 01

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Emergency lighting units.
3. Exit signs.
4. Luminaire supports.

B. Related Sections:

1. Section 26 2726 "Wiring Devices" for occupancy sensors and manual wall box dimmers.
2. Section 26 0519 “Low Voltage Electrical Power Conductors and Cables” for wire and cabling.

1.3 SYSTEM DESCRIPTION

A. Catalog numbers indicated in the Luminaire Schedule are a design series reference and do not necessarily represent the exact catalog number, size, voltage, wattage, type of light bar, driver, finish trim, ceiling type, mounting hardware or special requirements as specified or as required by the particular installations. Provide complete luminaire to correspond with the features, accessories, number of LED’s, wattage and/or size specified in the text description of each luminaire type. Additional features, accessories and options specified shall be included.

B. Provide all frames, supplementary support structures, hangers, spacers, stems, aligner canopies, auxiliary junction boxes and other hardware as required for a complete and proper installation. Recessed luminaires shall have frames that are compatible with the ceiling systems.

C. Luminaire voltage shall match the voltage of the circuit serving same.

1.4 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. IP: International Protection or Ingress Protection Rating.

D. LED: Light-emitting diode.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including lamp, reflector, and housing.

1.5 SUBMITTALS

A. Product Data: For each type of luminaire, arranged in order of luminaire designation. Include data on features, accessories, finishes, and the following:

1. Material and physical description of luminaire including dimensions.
2. Emergency lighting units including battery and charger.
3. Energy-efficiency data.
4. Life, output (lumens, CCT, and CRI), Kelvin temperature, and energy-efficiency data for LED light bars.
5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each luminaire type. The adjustment factors shall be for light bars, drivers, and accessories identical to those indicated for the luminaire as applied in this Project.

    a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer. LM-79 and LM-80 data for solid state lighting.
    b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Photometric data, certified by a qualified independent testing agency, in IESNA format, based on certified results of laboratory tests of each luminaire type, outfitted with light bars, drivers and accessories identical to those indicated for the luminaire as applied in the Project.
7. Low voltage transformers.
8. LED power supplies.
9. Types of LED’s, including manufacturer, wattage, and Color Rendering Index (CRI) and color temperature in degrees Kelvin (K).

B. Shop Drawings shall:

1. Show detail of nonstandard or custom luminaires.
2. Indicate dimensions, weights, method of field assembly, components, features and accessories.
3. For custom luminaires, modified luminaires or linear luminaires mounted in continuous rows, submit scaled drawings prepared by the manufacturer showing all details of construction, lengths in runs, pendant or power feed locations, accessories, finishes and lists of materials.
4. This Contractor shall provide the manufacturer with accurate field dimensions where required.
5. Include wiring diagrams, power and control wiring.

C. Wiring diagrams shall detail wiring for luminaires and differentiate between manufacturer installed and field installed wiring.

D. Product Certificates shall be signed by manufacturers of luminaires certifying that products comply with requirements.

E. Dimming Driver Compatibility Certificates shall be signed by the manufacturer of driver certifying that drivers are compatible with dimming systems and equipment with which they are used. Product Certificates signed by product manufacturer shall be provided for each type of driver for dimmer controlled luminaires.

F. Maintenance Data shall be provided for luminaires and equipment to include in emergency, operation and maintenance manuals specified in specifications section describing Operations and Maintenance Data.

G. Field quality control test reports.

H. Special Warranties specified in the Section.

I. Review of luminaire submittals which indicate voltage, mounting condition, or quantities shall not be considered to be approval of said voltage, mounting condition or quantities. This Contractor shall field verify voltage and actual mounting condition and method.

J. Product samples complete with housing, trim, specified lumen package, and 8' cord with plug for 120 V shall be submitted if requested.

1.6 CUSTOM LUMINAIRES

A. All custom luminaires require a prototype to be submitted prior to commencement of fabrication. The purpose of the prototype will be to review construction, LED placement within luminaire, LED type, optical assembly, finishes, etc. Modifications may be required as a result of prototype review. These modifications and others that do not materially affect the cost of the luminaire shall be incorporated at no additional cost to the Project, Architect, Lighting Designer, or Engineer.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and luminaires to include in emergency, operation, and maintenance manuals.

1. Provide a list of all arrays and driver types used on Project; use ANSI and manufacturers' codes.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Glass, Plastic Diffusers and Lenses: 10% or one dozen (whichever is less) of each type and rating installed. Furnish at least one of each type.
2. Globes and Guards: 5% of each type and rating installed. Furnish at least one of each type.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver luminaires individually wrapped in factory fabricated fiberboard type containers.

B. Handle luminaires carefully to prevent breakage, denting and scouring of the luminaire finish.

C. Store product in a clean, dry space, protected from weather.

1.10 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Authorities Having Jurisdiction, and marked for intended use.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Comply with NFPA 70.

E. Designated manufacturers are listed to define the requirements for quality and function of the specified product.

F. Mockups: Provide interior luminaires for room or module mockups complete with power and control connections.

1. Obtain Lighting Designer’s and Architect's approval of luminaires for mockups prior to starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Remove mockups when directed. Luminaires may be reinstalled in the Work with approval from the Client.
4. Install luminaires for mockups with power and control connections.
5. Mockups evaluated on the Project site may become part of the complete Work with the approval of the Client, Lighting Designer and Architect if the mockup is undisturbed at the time of substantial completion.

1.11 COORDINATION

A. Coordinate layout and installation of luminaires with ceiling system and other construction that penetrates ceilings or is supported by them including mechanical system, fire suppression, and technology and partition assemblies.

B. Provide all frames, supplementary support structures, hangers, spacers, stems, aligner canopies, auxiliary junction boxes and other hardware as required for a complete and proper installation.

C. Recessed luminaires shall have frames that are compatible with the ceiling system indicated on the Architectural Drawings.

D. Coordination Meetings: This Contractor shall meet at least twice with the ceiling installer. Hold first meeting before submittal of shop drawings to coordinate each luminaire mounting condition with ceiling type. During second meeting, coordinate luminaire layout in each area. This Contractor shall meet at least twice with the mechanical systems installer prior to fabrication and installation of ductwork. Coordinate depth and location of all luminaires with ductwork, fire suppression, and technology in all areas.

1.12 WARRANTY

A. Comply with Division 1 requirements.

B. General Warranty: Special warranty specified in this Section shall not deprive the Project of other Rights the Project may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by this Contractor under requirements of the Contract Documents.

C. Special Warranty for LEDs' and Drivers: Manufacturers standard form in which manufacturer of LED's and drivers agrees to replace components that fails in materials or workmanship within specified warranty period.

1. LED arrays: 10 years from date of Beneficial Occupancy.
2. Drivers: 10 years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products as listed in the Lighting Fixture Schedule or comparable products approved in writing by the Client.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES AND COMPONENTS

A. Recessed Luminaires: Comply with NEMA LE 4 for ceiling compatibility for recessed luminaires.

B. Luminaires: Comply with UL 1598.

C. Metal Parts: Free of burrs, sharp corners and edges. Metal work shall be free of tool marks and dents and shall have accurate angles bent as sharply as compatible with the gauges of the required metal. Intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly. All miters shall be in accurate alignment with abutting intersection members.

D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging. Luminaires to be painted after fabrication. Finish ferrous mounting hardware and accessories to prevent corrosion and discoloration to adjacent materials.

E. Luminaire hardware to comply with the following material standards: For steel and aluminum luminaires, all screws, bolts, nuts and other fastening and latching hardware shall be cadmium or equivalent plated. For stainless steel luminaires, all hardware shall be stainless steel.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Safety devices shall be detachable if necessary and shall not interfere with luminaire performance, maintenance or the seating of any luminaire element. Safety device shall not be visible during normal luminaire operation and from normal viewing angles.

G. Luminaires provided shall have means for disconnection from power source during service, as required in NEC Article 410.

H. Reflecting Surfaces: Minimum reflectance as follows, unless indicated otherwise:

1. White Surfaces: 85%
2. Specular Surfaces: 90%
3. Diffusing Specular Surfaces: 75%

I. Reflector cones shall adhere to the following:

1. Cones shall provide a minimum of 50 degree cutoff to source and source image.
2. Plastic material shall not be used for reflector cones.
3. Cones shall not be permanently fastened to the housing and shall be removable without tools. Retention devices shall not deform the cone or be visible from normal viewing angles.
4. Trim shall be flush to ceiling without gaps or light leaks. Where the flange trim is separate from the cone, it shall have the same finish as the reflector cone.
5. Reflector cones shall be uniform gauge, not less than 0.032" thick, high purity aluminum Alcoa 3002 alloy. Cones shall be free from spin marks or other defects.
6. Manufacture cones using the Alzak® process. Refer to Luminaire Schedule for cone color and finish, i.e., specular or diffuse requirements.

J. Lenses, Covers, Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100% virgin acrylic plastic. UV stabilized high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

    a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
    b. Lenses shall have uniform brightness throughout the entire visible area without LED pixelation.

2. Glass Globes: Annealed crystal glass unless otherwise indicated.

K. Adjustable luminaires shall have positive locking devices to fix aiming angle. Luminaires shall be capable of being relamped without adjusting aiming angle.

L. Each luminaire that has an array with a beam pattern or a spread lens that defines beam orientation shall contain locking devices to insure the orientation is not disturbed during array replacement or cleaning.

M. All luminaires and drivers shall operate within the temperature limits of their design and as specified by UL in the applications and mounting conditions specified.

N. Luminaires recessed in suspended ceilings where the space above the ceiling is either an air supply or return plenum shall conform to NEC Article 300-22.

O. Provide plaster frame for recessed luminaires mounted in other than T-bar ceilings. Verify mounting with architectural reflected ceiling plan before ordering luminaires.

P. Fixtures installed in "hard" ceilings shall have all connections accessible through the luminaire.

Q. Provide wire guards on all open strip type luminaires in unfinished spaces.

R. For weatherproof or vapor-tight installations, finishes of luminaires and accessories shall be a premium 5 stage TGIC polyester powder coat paint minimum 2.5 mils thick, applied to factory assembled and -tested luminaires before shipping, so that the entire assembly is completely corrosion resistant for the service intended. Exterior finishes shall have an outdoor life expectancy of not less than 20 years without any visible rust or corrosion. Where aluminum parts come in contact with bronze or steel parts, apply a coating material to both surfaces to prevent corrosion.

S. Luminaires for use outdoors or in areas designated as damp locations shall be suitable gasketed to prevent the entrance of moisture. Provide approved wire mesh screens for ventilation openings. Dissimilar metals shall be separated by non-conductive material to prevent galvanic action.

T. Factory-Applied Labels: Comply with UL 1598. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when light bars are in place.

U. Luminaires shall be free of light leaks while providing sufficient ventilation of LED's and drivers to provide the required photometric performance.

V. Luminaires shall hold LED arrays securely against normal vibration and maintenance handling.

2.3 LUMINAIRES

A. Housing shall be minimum code gauge steel construction painted after fabrication with high reflectance white paint unless otherwise indicated.

B. Shielding shall adhere to the following criteria:

1. Flat frosted diffuser shall be 100% virgin acrylic, pattern #12, and shall have matte finish on exterior side. Diffuser shall be of sufficient density to completely obscure LED image.
2. Flat clear lenses shall be injection molded 100% virgin acrylic.
3. Clear patterned lenses shall be injection molded 100% virgin acrylic, pattern #12.
4. Clear patterned lenses shall be polycarbonate, pattern #12.
5. Minimum thickness shall not be less than 0.125" with a minimum weight of 8 ounces per square foot.

C. Doorframes shall be supplied with concealed hinges and latches. Provide mitered corners with no gaps or light leaks.

2.4 EMERGENCY BATTERY PACK FOR LUMINAIRES

A. Manufacturers:

1. All manufacturers are accepted provided they comply with the specifications given in the Technical Specifications Book.

B. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within/top of luminaire body and compatible with driver. Comply with UL 924.

1. Indicator light: Visible without opening luminaire or entering ceiling space. Indicator Light: LED indicates normal power on.

2. Battery: Sealed, maintenance-free, nickel-cadmium type, sized for ninety (90) minutes of operation.
3. Charger: Fully automatic, solid-state.
4. Integral Self-Test: Factory-installed electronic device automatically initiates code required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
5. Universal Voltage input.

2.5 MESSAGE SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance and lettering size. Comply with Authorities Having Jurisdiction, State and Local Codes.

B. Coordinate with Division 28 requirements.

C. Electrical: Internally mounted, universal 120/277V transformer.

D. Internally Lighted Signs:

1. Light bars for AC operation: LED, 70,000 hours minimum rated life.

E. Heavy gauge steel housing and stenciled faceplate with glass or thermoplastic color shield.

1. Legend: See Luminaire Schedule.

2.6 LED LUMINAIRES AND DRIVERS

A. All Luminaires

1. Comply with IES LM-79-08 Approved Method for measuring lumen maintenance of LED light sources.
2. Comply with IES LM-80-08 Approved Method for electrical and photometric measurement of SSL product.
3. Comply with In-Situ testing for more reliable results.
4. LED's shall be Restriction of Hazardous Substances Directive (RoHS) compliant.
5. LED arrays shall be sealed, high performance, long life type; minimum 70% rated output at 50,000 hours. (L70)
6. LED luminaires shall deliver a minimum of 80 lumens per watt.

    a. LED's shall be "Bin No. 1" quality.

7. Drivers shall be solid state and accept 120 through 277 VAC at 60 Hz input.
8. The LED light source shall be fully dimmable with use of compatible dimmers switch designated for low voltage loads.
9. LED color temperatures: [**3000/3500/4000/other (requires approval)**] as noted, +/- 275K.
10. Luminaires shall have internal thermal protection.
11. Luminaires shall not draw power in the off state. Luminaires with integral occupancy, motion, photo-controls, or individually addressable luminaires with external control and intelligence are exempt from this requirement. The power draw for such luminaires shall not exceed 0.5 watts when in the off state.
12. Color spatial uniformity shall be within .004 of CIE 1976 diagram.
13. Color maintenance over rated life shall be within .007 of CIE 1976.
14. Indoor luminaires shall have a minimum CRI of 85.

15. Luminaire manufacturers shall adhere to device manufacturer guidelines, certification programs, and test procedures for thermal management
16. LED package(s)/module(s)/array(s) used in qualified luminaires shall deliver a minimum 70% of initial lumens, when installed in-situ, for a minimum of 50,000 hours.
17. Luminaires shall be fully accessible from below ceiling plane for changing drivers, power supplies and arrays.

B. Power Supplies and Drivers

1. Power Factor: 0.90 or higher
2. Maximum driver case temperature not to exceed driver manufacturer recommended insitu operation.
3. Output operating frequency: 60Hz.
4. Interference: EMI and RFI compliant with FCC 47 CFR Part 15.
5. Total Harmonic Distortion Rating: 20% Maximum.
6. Meet electrical and thermal conditions as described in LM-80 Section 5.0.
7. Fully dimmable, 0 – 10 VDC standard.
8. Secondary Current: Confirm secondary current specified by individual luminaire manufacturers.
9. Compatibility of dimming switches: Certified by manufacturer for use with individually specified luminaire and individually specified control components.

2.7 LED ARRAYS

A. All LED's of the same type are to be provided by the same manufacturer.

B. Equip each luminaire with the proper LED array of the type shown or specified in the Luminaire Schedule

2.8 WIRING

A. No internal wiring shall be visible at normal viewing angles.

2.9 LUMINAIRE SUPPORT COMPONENTS

A. Single-Stem Hangers shall be 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish shall be the same as the luminaire.

B. Twin-Stem Hangers shall be two, 1/2-inch steel tubes with single canopy arranged to mount a single fixture. Finish shall be the same as the luminaire.

C. Rod Hangers shall be 3/16-inch minimum diameter, cadmium-plated threaded steel rod.

D. Wires shall be ASTM A 641/A 641M, Class 3, soft temper, zinc coated steel, 12 gauge.

E. Wires for humid spaces shall be ASTM A 580/A 580M, composition 302 or 304, annealed stainless steel, 12 gauge.

F. Aircraft Cable Support shall use cable, anchorages, and intermediate supports recommended by luminaire manufacturer.

G. Hangers for pendant industrial luminaires shall be heavy duty No. 8 jack chain with hangers, "S" hooks, mounting straps, and all required accessories for complete installation.

2.10 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with Authorities Having Jurisdiction.

Eco-Smart brand LED exit sign.

1. **AC only or battery backup as scheduled.**
2. **Universal mount canopy.**
3. **Green Letters on white or black, mirror or brushed nickel field as scheduled.**
4. **Directional chevrons as indicated, field configurable.**
5. **LED panel, 0.25 W.**
6. **Self-Powered Exit Signs (Battery Type): Integral automatic charger in a selfcontained power pack with nickel metal hydride battery with self diagnostics**.]

B. Internally Lighted Signs:

1. Products: Provide products as listed in the Lighting Fixture Schedule.
2. Steel Housing, 20 gauge white finish.
3. Glass or plastic faceplate.
4. Red Letters on white field.
5. Directional chevrons as indicated.
6. *Field selectable full size arrow designations.*
7. Light bars: LED, 70,000 hours minimum rated lamp life.
   a. Individual LED modules shall not be visible.
8. *Maximum power consumption: 5 watts.*
9. AC powered signs shall be 120/277V input.
10. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

    a. LED, 70,000 hours minimum rated lamp life.
    b. Battery: Two hour capacity sealed, maintenance-free, Ni Cad type, five year manufacturer warranty.
    c. Charger: Fully automatic, solid-state type with sealed transfer relay.
    d. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects light bars from battery, and battery is automatically recharged and floated on charger.
    e. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    f. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
    g. Integral Self-Test: Factory-installed electronic device automatically initiates coderequired test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.11 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Housing: 20 ga. Steel.
2. Flexible cord and plug connections shall not be permitted.
3. Battery: Sealed, maintenance-free, lead-acid type.
4. Charger: Fully automatic, solid-state type with sealed transfer relay.
5. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
6. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
7. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
8. Wire Guard: Heavy-chrome-plated wire guard to protect lamp heads or units in areas where subject to physical damage.
9. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
10. Integral Self-Test: Factory-installed electronic device automatically initiates code required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
11. Factory supplied molded plug and cord where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Luminaires:

1. Set level, plumb, and square with ceilings and walls, and secure according to manufacturer's written instructions and approved submittal materials, unless otherwise indicated.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, and reinstall.

C. Remote Mounting of Drivers: Distance between the driver and fixture shall not exceed that recommended by manufacturer. Verify, with manufacturers, maximum distance between driver and luminaire.

D. Mounting height indicated from finished floor to bottom of pendant luminaire or to the center of the outlet box for wall mounted luminaires unless otherwise noted. Verify mounting heights with Architect and Lighting Designer.

E. Mounting height may also be indicated as the length of the pendant below finished ceiling.

F. Lay-in Ceiling Luminaire Supports: Use grid as a support element.

1. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4inch metal channels spanning and secured to ceiling tees. In addition, provide slack

earthquake safety wire hangers secured diagonally from opposite luminaire corners to structural members above suspended ceiling.

G. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
5. All power feeds shall originate from the same location/end of each run.
6. Where pendants or rods are longer than 48”, brace to limit luminaire swinging.

H. Provide all necessary hanging or mounting devices and accessories for all luminaires. Verify the types needed for various ceiling conditions. Plaster rings shall be provided where required.

I. Verify weight and mounting method of all luminaires prior to ordering and provide suitable support. Coordinate with General Contractor for luminaires that require additional blocking or support. Luminaire mounting assemblies shall comply with all local seismic codes and regulations.

J. Metal decking shall not be pierced for luminaire support.

K. Refer to architectural reflected ceiling plans for coordination of luminaire locations with mechanical, fire protection, technology and fire safety equipment. Where conflicts occur, coordinate with Architect, Engineer and Lighting Designer prior to installing any of the Systems.

L. In accessible suspended ceilings, luminaire wiring connections, including equipment grounding conductor, is to be through use of 72-inch (maximum) flexible conduit from a rigidly supported junction box.

M. Wire per requirements of branch circuit installation. Properly ground each luminaire.

N. Luminaires located in recessed ceilings with a fire resistive rating of 1 hour or more shall be enclosed in an approved fire resistive rated box equal to that of the ceiling. Acoustical ceiling tiles are not acceptable.

O. Install luminaires with vent holes free of air blocking obstacles.

P. This Contractor shall be responsible for adjusting aperture flanges or rings on all recessed luminaires to be flush with the finished ceiling. Trim shall completely conceal ceiling opening.

Q. Brace suspended luminaires installed near ducts or other elements so that they do not swing into obstructions.

R. Wall mounted luminaires shall be supported from four-square outlet box plaster ring and from wall at non-feed end with two 1/4-inch toggle bolts for gypsum board walls or 1/4-inch bolts to pre-set inserts for concrete wall.

S. Luminaires shall not be secured to ductwork or other Systems.

T. Adjust variable position lampholders for proper lamp position prior to luminaire installation.

U. Connect wiring according to Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 DOWNLIGHT LUMINAIRES

A. Recessed Type in Accessible Ceilings: Mount in frames suitable for the ceiling with the recessed portion of the luminaire securely supported from the ceiling opening by use of a metal trim ring.

B. Recessed Type in Non-accessible Ceilings: As Specified for mounting in accessible ceilings, except provide access to wiring and driver through the ceiling opening for the luminaire.

3.3 LUMINAIRES

A. Recessed Type: Support luminaires independent of the ceiling suspension system. Provide four integral tabs (one at each corner) which rotate into position and lock on ceiling tees after luminaire is lifted into the ceiling cavity or provide four clips similar to Caddy #535. Provide mounting frames suitable for the ceiling type. In addition, provide slack earthquake safety wire hangers secured diagonally from opposite luminaire corners to structural members above suspended ceiling.

B. Wall Mounted Type: Support from four-square outlet box plaster ring and from wall at non-feed end with two ¼ inch toggle bolts for gypsum board walls or ¼ inch bolts to pre-set inserts for concrete wall.

C. If clearance above T-bar system is too restricted to "tip-in" luminaire, coordinate with acoustic ceiling installer by leaving one cross T-bar off until the cross T-bar shall be secured into its proper place. Luminaires installed in hidden-spline-type ceilings shall have supporting channels installed by Ceiling Contractor to adequately support the luminaire without providing additional hangers from the structural ceiling above the suspended ceiling.

D. D. Surface Mounted Type:

1. Where mounted on accessible ceilings, support from structural members above ceiling by means of hanger rods through ceiling or as approved.
2. Continuous Runs of Luminaires: Laser sight to insure luminaires are straight and true when sighting from end to end, regardless of irregularities in the ceiling. Where luminaires are so installed, omit ornamental ends between sections. All seams/ joints shall be tightly fitted.

E. Pendant Mounted Type:

1. Provide strong back channel entire luminaire length unless luminaire is designed specifically to be self-supporting.
2. Where suspended below accessible ceiling, provide structural support at suspended ceiling level from structural members above ceiling. Do not run hanger rods through ceiling.
3. Continuous Runs of Luminaires: Laser sight to insure luminaires are straight and true when sighting from end to end, regardless of irregularities in the ceiling. Where luminaires are so installed, omit ornamental ends between sections. All seams/joints shall be tightly fitted.
4. All power feeds shall originate from the same location/end of each run.

F. Install luminaire diffusers only after construction work, painting and clean up are completed.

3.4 LED LUMINAIRES

A. Adhere to manufacturers installation guidelines regarding proper thermal management.

3.5 LIGHTING CONTROL

A. Provide branch circuiting in coordination with the requirements of Division 26 Wiring Device Section and as indicated.

B. Where Quantum lighting control panels are used to sweep after hours in open areas or classrooms, provide all necessary interconnecting wiring and control modules, and local override switches for after hours operation.

3.6 CLEANING AND ADJUSTING

A. Remove protective plastic covers from luminaires and luminaire diffusers only after construction work, painting and clean-up are completed. Remove, clean, and reinstall all dirty reflectors and diffusers.

B. Clean luminaires internally and externally after installation. Use methods and materials recommended by manufacturer for cleaning Alzak reflectors and other surfaces.

C. Make final adjustment of aimable luminaires and adjustable light settings under the direction of the Architect and/or Lighting Designer during a scheduled period of time prior to the completion of the Project, after normal business hours if required. Include all equipment and personnel expenses including overtime required for focusing.

D. Luminaires, reflectors, louvers and accessories which are damaged, blemished, or impregnated with fingerprints shall be replaced at this Contractor's expense. All finishes shall be unmarred upon Project completion.

3.7 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery/generator and retransfer to normal. Walk test and verify foot-candle levels meet Code with meter.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

C. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

D. Replace all inoperable LED arrays at the end of construction prior to project beneficial occupancy.

E. Advance Notice: Give dates and times for field tests.

F. Provide instruments to make and record test results.

G. Malfunctioning Luminaires and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

3.9 ADJUSTING

A. Occupancy Adjustments: Within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this Work may be required after dark.

1. Adjust aimable luminaires in the presence of Architect and Client representative.

END OF SECTION 26 51 00

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section provides general requirements for a complete and fully operational Exterior Lighting System including:

1. Exterior Luminaires
2. Accessories
3. Luminaire supports
4. Poles
5. LED Arrays
6. Controls
7. Standard Fixture Schedule

B. Related Sections:

1. Section 26 51 00 "Interior Lighting" for exterior luminaires normally mounted on exterior surfaces of buildings.
2. Section 26 05 19 “Low Voltage Electrical Power Conductors and Cables” for wire and cabling.

1.3 SYSTEM DESCRIPTION

A. Catalog numbers indicated in the Luminaire Schedule are a design series reference and do not necessarily represent the exact catalog number, size, voltage, wattage, type of LED, driver, finish trim, mounting hardware or special requirements as specified or as required by the particular installations. Provide complete luminaire to correspond with the features, accessories, number of LED’s, wattage and/or size specified in the text description of each luminaire type. Additional features, accessories and options specified shall be included. B. Luminaire voltage shall match the voltage of the circuit serving same.

1.4 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Luminaire: Complete lighting fixture, LED arrays, including driver housing.

E. Pole: Luminaire support structure, including tower used for large area illumination.

F. Standard: Same definition as "Pole" above.

1.5 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.

C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.

1. Basic wind speed of calculating wind load for poles 50 feet (15 M) high or less is 90 mph.

a. Wind Importance Factor: 1.3.
b. Minimum Design Life: 25 years.
c. Wind induced vibration.

1.6 SUBMITTALS

A. The authorized manufacturer's representative for the Project area shall prepare Submittals for each luminaire type. In addition to the luminaire Submittals, a list shall be provided identifying the manufacturer representative for each luminaire type. Provide manufacturers' names, addresses, and telephone numbers. Requests for prior approval shall also include this information. Submittals or requests for prior approval without this information will be rejected.

B. Product Data shall indicate that luminaire, LED arrays, and drivers fully comply with Contract Documents. Data shall be submitted for each type of luminaire indicated, arranged in order of luminaire designation. For standard catalog luminaires provide original product catalog sheets indicating data on features, accessories, finishes, and the following:

1. Materials and dimensions of luminaires.
2. Photometric data, in IESNA format, based on certified results of laboratory tests of each luminaire type, outfitted with LED arrays, drivers and accessories identical to those indicated for the luminaire as applied in the Project.

a. Photometric data shall be certified by a qualified independent testing agency.
b. Foot-candle map including existing fixtures' contributions

3. Low voltage transformers.
4. LED power supplies.
5. Types of LED's, including manufacturer, wattage, and Color Rendering Index (CRI) and color temperature in degrees Kelvin (K).
6. Wireless controls: nodes, gateways, modems, and server.

C. Shop Drawings shall:

1. Show details of nonstandard or custom luminaires.

2. Indicate dimensions, weights, method of field assembly, components, features, and accessories.
3. This Contractor shall provide the manufacturer with accurate field dimensions where required.
4. Include wiring diagrams, power and control wiring.

D. Wiring Diagrams shall detail wiring for luminaires and differentiate between manufacturer installed and field-installed wiring.

E. Product Certificates shall be signed by manufacturers of luminaires certifying that products comply with requirements.

F. Maintenance Data shall be provided for luminaires and equipment to include in emergency, operation, and maintenance manuals Specified in Specifications Section describing Operations and Maintenance Data.

G. Field quality control test reports.

H. Special Warranties Specified in this Section.

I. Review of luminaire submittals which indicate voltage, mounting condition, or quantities shall not be considered to be approval of said voltage, mounting condition, or quantities. This Contractor shall field verify voltage and actual mounting condition and method.

J. Product samples complete with housing, trim, specified lumen package, and 8’ cord with plug for 120 V shall be submitted if requested.

K. Pole and Support Component Certificates: Signed by Manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a Professional Engineer.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and luminaires to include in emergency, operation, and maintenance manuals.

1. Provide a list of all driver types used on Project; use ANSI and manufacturers' codes.
2. Submit site map showing dimensioned locations all exterior lighting fixtures with tags consistent with the Project’s standard naming convention. Also show stubbed-out spare conduits, in-ground junction boxes, and underground sleeves. Indicate dimensioned locations of sleeve ends, conduits, and junction boxes from a permanent building or landscape feature. Circuit numbers for all loads shall be shown. Electronic files of site lighting maps be provided at Substantial Completion and submitted to the Electric Shop.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Glass, Plastic Diffusers and Lenses: 10% or one dozen (whichever is less) of each type and rating installed. Furnish at least one of each type.
2. Globes and Guards: 5% of each type and rating installed. Furnish at least one of each type.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Package poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle with web fabric straps.

1.10 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Authorities Having Jurisdiction, and marked for intended use.

C. Comply with IESNA TM-15-11 and Addendum A for Backlight, Uplight, and Glare (BUG) ratings.

D. Comply with ANSI C7.3777.208 Standards for chromaticity of SSL products.

E. Comply with NFPA 70.

F. All luminaires shall bear a UL or ETL label.

G. Comply with IEEE C2, “National Electrical Safety Code.”

H. Designated manufacturers are listed in the Luminaire Schedule to define the requirements for quality and function of the specified product.

1.11 COORDINATION

A. Coordinate layout and installation of luminaires with plantings, paving, site walls, other site work elements, and existing luminaires.

B. Coordination Meetings: This Contractor shall meet at least twice with the sitework installer(s) and Chief Electrician (or his designee). Hold first meeting before submittal of shop drawings to coordinate each luminaire mounting condition and location. During second meeting, coordinate layout with other site components. Coordinate depth and location of all luminaire pole bases in all areas.

1.12 WARRANTY

A. Comply with Division 1 requirements.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Fixture, including the LEDs, drivers and electrical components: Ten years from date of Beneficial Occupancy.
2. Warranty Period for housing paint and finish: Ten years from date of Beneficial Occupancy.
3. Warranty Period for Color Retention: Ten years from date of Beneficial Occupancy.
4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less ten years from date of Beneficial Occupancy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings and/or the Schedule at the end of this document.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to Authorities Having Jurisdiction.

B. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Comply with IESNA TM-15-07 Luminaire Classification System for Outdoor Luminaires.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit easy replacement of drivers. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Baffles made of metal or similar sturdy material, field installable and adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Optical assemblies: where specified, full cutoff with zero uplight, “dark sky” compliant. LED assemblies shall comply with IESNA BUG rating system.

K. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 90 percent.
3. Diffusing Specular Surfaces: 75 percent.

L. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses in luminaire doors.

M. Luminaires utilizing internal refractors are not allowed.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Finish: premium 5 stage TGIC polyester powder coat paint minimum 2.5 mils thick, applied to factory-assembled and -tested luminaires before shipping. Where indicated, match the finish process and color of pole or support materials.

a. Color: See Luminaire Schedule.

O. Decorative Fixtures:

1. Shall have minimum 74 lumens per watt.

P. Outdoor Wall Mounted Area Luminaires

1. Shall have minimum 90 lumens per watt.
2. No more than 48% of the total luminaire output shall be within the forward 60-80º zone.
3. No more than 3% of the total luminaire output shall be in the forward 80-90º zone.
4. No light at or above horizontal 90-180º zone.

Q. Canopy Luminaires

1. Shall have minimum 100 lumens per watt.
2. At least 30% of total luminaire output shall be within the 40-60º zone.
3. No more than 20% of total luminaire output shall be above the 80º zone.

2.3 LED DRIVERS AND ARRAYS

A. UL 1598 listing.

B. LED arrays shall have LED's that produce minimum 80 lumens/watt @ 525mA.

1. Lumen Depreciation Data: maintain greater than 95% lumen maintenance at 60,000 hours per IES TM-21.
2. LED color: neutral white, 4000 deg K, minimum CRI of 70, or as scheduled on the drawings.

C. LED arrays shall have an IP66 enclosure rating.

D. Driver + LED Life Rating not less than 100,000 hours.

E. Power supply / driver shall be field replaceable by means quick-disconnect connectors and easy access mounting hardware.

F. Drives shall accept 120 – 277 volts or 480 volts, 60 Hz.

G. Power Factor > 0.9@ full load.

H. THD < 20% @ full load.

I. Surge protection: 10kA/10kV per ANSI/IEEE C136.2-2014

J. The housing shall have an integral thermal management system with extruded aluminum radiation fins and lateral airways for passive cooling, no devices using moving parts are permitted.

K. Minimum starting temperature: minus 30 deg C, 40 deg C ambient.

L. Comply with IES LM-79-08 and LM-90-08 Approved Methods.

M. Comply with In-Situ testing for more reliable results.

N. LED's shall be Restriction of Hazardous Substances Directive (RoHS) compliant.

2.4 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Compatible with 7 – pin socket.

C. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Adjustable window slide for adjusting on-off set points.

2.5 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.

2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Minimum clear opening of 2-1/2 by 5 inches with cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 3 Concrete Sections.

2.6 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 429/B 429M, Aluminum Alloy 6063-T6, unless noted otherwise, and access handhole in pole wall.

1. Shape: Refer to Luminaire Schedule or shall match existing site poles.
2. Mounting Provisions: Butt flange for bolted mounting on foundation.

B. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

C. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 26 0526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

D. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, and then bolted together with stainless-steel bolts.

1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.
2. Finish: Match pole and luminaire material and finish.

E. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by “AA", comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Finish: Premium five (5) stage TGIC polyester powder coat paint.

a. Color: As selected by Architect from manufacturer's full range or to match existing adjacent poles.

2.7 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

B. Fusing: One in each ungrounded power supply conductor. Voltage and current ratings as recommended by driver manufacturer. Fuseholders shall be completely waterproof and shall grip the fuse in the load side section when opened. The circuit shall be fused in the base of the pole and accessible through the handhole.

C. Banner Arms: Use shall be approved by NU Chief Electrician. Coordinate with manufacturer for maximum banner size limitations to avoid banner arm or pole failure. Banner arms shall be break-away type designed to fail before over stressing the pole.

D. Wind Mitigation Devices: Provide in areas of consistent, high, uneven winds.

E. Duplex Receptacle: In central areas of congregation, provide a NEMA 5-20R Duplex Receptacle in a weatherproof assembly complying with Section 26 2726 "Wiring Devices" for ground-fault circuit-interrupter (GFCI) type.

1. Recessed, nonmetallic polycarbonate plastic or reinforced fiberglass, weatherproof in use, cover, color to match pole, with cord opening, that when mounted results in NEMA 250, Type 3R enclosure mounted 36” above finished grade. With lockable hasp and latch that complies with OSHA lockout and tag-out requirements.

2. Where noted, provide minimum 1800-W transformer, 120V secondary, protected by replaceable fuses, mounted behind access cover.

F. Outdoor Wireless Controls: Where noted, provide wireless controls for remote monitoring, control, energy measurement and GPS mapping of pole mounted exterior luminaires.

1. Products: “Light-Grid™” Outdoor Wireless Control System by General Electric.
2. Basic Description: system consists of the following components:

    a. Node
    b. Gateway
    c. Modem
    d. Central Management System server

3. Functional Performance: Gateway shall receive real time data from each Node. Transmitted messages shall include voltage, current, power factor, wattage, and hours of operation. Gateway and shall automatically transmit the status of each luminaire along with a unique code that identifies the transmitting station to the Central Management System (CMS) via modem.
4. Provide network communications for the system according to manufacturer's written requirements.
5. Furnish each luminaire with a 7–pin twist lock receptacle for connection to controls. Provide weather tight shorting cap when controls not in use.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

B. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

1. Provide house side shields where necessary to control spill light.

3.2 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 CONNECTIONS

A. [**Outdoor Wireless Control Systems: Provide all communications wiring between remote metering and control modules. Verify that each luminaires’ address for communication packages corresponds to data network requirements**.]

3.6 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Replace all burned out or inoperative LED arrays at the end of Construction prior to Project occupancy.

C. Advance Notice: Give dates and times for field tests.

D. Provide instruments to make and record test results.

E. Test as follows:

1. Verify proper operation, switching and phasing of each luminaire after installation.
2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation. Verify normal transfer to generator and retransfer to normal.
3. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to the lighting system, retest to demonstrate compliance with standards.

F. Malfunctioning Luminaires and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

G. Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.
2. [**Verify operation of wireless controls, test send and receive data/commands between luminaires and CMS**.]

H. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):

a. IESNA LM-64, "Photometric Measurements of Parking Areas."
b. IESNA LM-72, "Directional Positioning of Photometric Data."

I. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards. Submit Electronic files of site lighting maps to the Electric Shop.

END OF SECTION 26 56 00

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Erosion and Sedimentation Control.
2. Site Demolition:

    a. Selective Site Demolition:

        1) Demolition of retaining walls, foundations, pavements, curbs and gutters, drainage structures, and utilities, and backfilling voids resulting from removals or demolition.

3. Site Clearing:

    a. Protection of Existing Trees

1. Removal of Trees and Other Vegetation
2. Topsoil Stripping and Stockpiling
3. Clearing and Grubbing
4. Removing Above-Grade Improvements, As Indicated On Drawings

B. Related Sections:

1. Section 01 50 00 - Construction Facilities and Temporary Controls
2. Section 31 20 00 – Earth Moving

1.02 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Conform to applicable local code for demolition of structures, safety of adjacent structures, dust control and runoff control.
2. Obtain required permits and licenses from authorities. Pay associated fees including disposal charges.
3. Notify affected utility companies before starting work and comply with their requirements.
4. Do not close or obstruct roadways, sidewalks or hydrants without permits.
5. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.
6. Test soils around buried tanks for contamination.

B. In addition to complying with all pertinent codes, the Contractor will also comply with the requirements of those insurance carriers providing coverage for existing structures and this work.

1. Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling disposal regulations of authorities having jurisdiction.

C. Arborist Qualifications: An arborist certified by the International Society of Arboriculture or licensed in the jurisdiction where Project is located.

D. Tree Pruning Standards: Comply with ANSI A300, "Trees, Shrubs, and Other Woody Plant Maintenance - Standard Practices," unless more stringent requirements are indicated.

1.03 PROJECT CONDITIONS

A. Existing Conditions:

1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. Variations within structures may occur by Owner's removal and salvage operations prior to start of demolition work.

   a. Start of work is acceptance of conditions.

2. Notify Owner of variations to conditions or discrepancies in actual site conditions prior to start of site preparation Work.
3. Structures to be demolished will be discontinued in use and vacated prior to start of work.
4. Owner assumes no responsibility for condition of structures to be demolished.

B. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

C. Existing Services:

1. General: Indicated locations are approximate; determine exact locations before commencing Work.
2. Arrange and pay for disconnecting, removing, capping, and plugging utility se5rvies. Notify affected utility companies in advance and obtain before starting this Work.
3. Place markers to indicated location of disconnected services. Identify service lines and capping locations on Project Record Documents.

D. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

1. Restore damaged improvements to their original condition, as acceptable to property Owners.
2. Provide protection for safe passage of persons around area of site preparation. Take precautions and conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.
3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

E. Protection of Existing Trees and Vegetation: Protect tops, trunks, and roots of existing trees and other vegetation to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

1. Install Temporary fencing located as indicated or outside the drip line of trees to protect remaining vegetation from construction damage. Utilize plastic snow fence materials as approved by Owner's Representative.
2. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
3. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out. Cover with earth as soon as possible.
4. Repair or replace trees and vegetation to remain, which are damaged by construction operations, in a manner acceptable to Owner's Representative. Employ a licensed Arborist to repair damages to trees and shrubs.

F. Improvements on Adjoining Property: Authority for performing removal and alteration work on property adjoining Owner's property will be obtained by Owner prior to award of Contract.

G. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises were indicated or directed.

PART 2
2.01 FILL MATERIALS

A. Specified in Section 31 20 00– Earth Moving

PRODUCTS

N/A

PART 3 EXECUTION

3.01 PREPARATION

A. Provide, erect, and maintain erosion control devices, temporary barriers and security devices at locations indicated as specified in Section 01 50 00 and as shown on Drawings.
B. Protect existing landscaping materials, appurtenances and structures and other features indicated to remain.
C. Prevent movement or settlement of adjacent structures: Provide bracing and shoring.
D. Mark location of utilities. Protect and maintain in safe and operable condition the utilities to remain. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities and the Owner.

3.02 ITE DEMOLITION

A. General:
    1. Document existing conditions of adjacent areas prior to start of demolition.
    2. Conduct demolition to minimize interference with adjacent structures or pavements.
    3. Cease operations immediately if adjacent structures appear to be in danger. Notify authority having jurisdiction. Do not resume operations until directed.
    4. Conduct operations with minimum interference to public or private access. Maintain access and egress at all times.
    5. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.

6. Sprinkle Work with water to minimize dust. Provide hoses and water connections for this purpose.
7. Comply with governing regulations pertaining to environmental protection.
8. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

B. Pollution Controls:

1. Furnish and install temporary control measures for erosion and sedimentation in accordance with authorities having jurisdiction.
2. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

   a. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

   a. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

C. Salvage Materials:

1. All demolished material shall be offered to the Owner. If not desired by the Owner, materials shall become property to be removed from site and disposed of by the Contractor at his expense unless noted otherwise on the Drawings.

2. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance remain to the Owner. Notify the Owner's representative if items are encountered and obtain acceptance regarding method of removal and salvage for the Owner.

3.03 SITE CLEARING AND GRUBBING

A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes digging out and off-site disposing of stumps and roots.

1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.
2. Completely remove stumps, roots, and other debris protruding through ground surface.
3. Use only hand methods for grubbing inside drip line of trees indicated to remain.
4. All roots 3 inches and greater in diameter shall be removed within 5'-0" of all existing or new site improvements.

3.04 STRIPPING AND STOCKPILING OF TOPSOIL

A. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, or over 3’ in length, and without weeds, roots, and other objectionable material.

1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
   a. Remove heavy growths of grass from areas before stripping.
   b. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
2. Stockpile topsoil were indicated on Drawings or directed by Owner's Representative. Construct stockpile areas to positively drain surface water. Cover stockpile areas as required to prevent windblown dust. Dispose of unsuitable topsoil off-site as specified clearing, unless directed otherwise by Owner's Representative. Dispose of excess topsoil off-site as specified for clearing, unless directed otherwise by Owner's Representative.
   a. Stockpile to be a maximum of 10' in height.
   b. Install silt fence around perimeter of the stockpile area.

3.05 BACKFILLING

A. Completely fill below grade areas and voids resulting from demolition or removal of structures (including underground fuel storage tanks, wells, cisterns, etc.) using approved select fill materials consisting of stone, gravel, and sand free from debris, trash, frozen materials, roots, and other organic matter.

1. Fill depressions caused by clearing and grubbing operations with acceptable fill material to subgrade elevation.
2. Ensure that areas to be filled are free of standing water, frost, frozen, or unsuitable material, trash, and debris prior to fill placement.
3. Place fill materials in horizontal layers and compact each layer at optimum moisture content of fill material to proposed density as specified in Section 02300 (31 20 00) - Earthwork.
4. Grade surface to match adjacent grades and to provide flow of surface drainage after fill placement and compaction.

3.06 EXCAVATION AROUND EXISTING TREES

A. Excavation Around Trees to Remain:

1. Where trenching for utilities is required within drip line, hand dig under or around roots. Do not cut lateral roots or tap roots. Cut smaller roots interfering with new construction.
2. Where excavating for new construction is required within drip line of trees, hand excavate to minimize damage to root systems and provide sheeting at excavations if required. Use narrow tine spading forks and comb soil to expose roots. Relocate roots in backfill areas. If large, main lateral roots are encountered, exposed beyond excavation limits, bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches back from new construction.

3. Allow no exposed roots to dry out before permanent backfill is placed; provide temporary earth cover, or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with backfill.
4. Prune branches in accordance with standard horticultural practice to balance loss to root system caused by damage or cutting of root system. Engage qualified arborist to prune branches.

B. Grading and Filling Around Trees Near Clearing Limits:

1. Existing Grades: Maintain existing grading within drip line of trees, unless otherwise indicated on the Drawings.
2. Lowering Grades: Where existing grade is above new finish grade shown around trees, carefully hand excavate within drip line to new finish grade. Cut roots exposed by excavation or provide permanent protection as recommended by arborist.
3. Raising Grades:
    a. Minor Fill: Where existing grade is 6 inches or less below elevation of finish grade shown, use a topsoil fill mixture. Place a single layer and do not compact; hand grade to required finish elevations.
    b. Moderate Fills: Where existing grade is more than 6 inches but less than 12 inches below finish grade elevation, place layer of drainage fill on existing grade elevation prior to placing topsoil. Carefully place against trunk of tree approximately 2 inches above finish grade elevation and extend not less than 18 inches from tree trunk on all sides. For balance of area within drip line perimeter, place drainage fill to an elevation of 6 inches below grade and complete fill with a layer of topsoil to finish grade elevation. Do not compact stone or gravel or topsoil layers, and grade to required elevations.

3. Repair for Damaged Trees:
    1. Engage a qualified arborist to perform tree repair work.
    2. Make repairs promptly after damage occurs to prevent progressive deterioration.
    3. Remove dead and damaged trees which are determined by arborist to be incapable of restoration to normal growth pattern.

3.07 REMOVAL

A. Remove debris, rock, extracted plant life, paving, curbs, and other structures indicated on Drawings and as specified.
B. Disposal of Demolished Materials:
    1. Remove from site debris, rubbish, and other materials resulting from demolition operations.
    2. No burning of any material, debris, cleared material, or trash on-site or off-site will be allowed, except when allowed by the appropriate governing authority and the Owner. If allowed as stated above, burning shall be performed in manner prescribed by governing authority. Attend burning materials until fires have burned out or have been extinguished.
    3. Transport cleared and demolished materials with appropriate vehicles and dispose off-site to areas which are approved for disposal by governing authorities and appropriate property owners.
C. Remove grass, trees, plant life, stumps and all other construction debris from site to a dump site that is suitable for handling such material according to state laws and regulations.

D. Remove erosion control materials.

END OF SECTION

SECTION 31 20 00
EARTH MOVING

PART 1 - GENERAL

1.01 DESCRIPTION:

Make excavation of normal depth in earth for trenches and structures; backfill such excavations; furnish necessary material and construct embankments and fills; make miscellaneous earth excavations and miscellaneous grading.

1.02 QUALITY ASSURANCE:

A. Wherever a percentage of compaction is indicated or specified, use percent of maximum density at optimum moisture as determined by Method D of ASTM Standard and Soil Aggregate Mixture Using 10-1B. (4.54 kg). Hammer and 10-in. (457mm) Drop, Designation D1557-78 and/or AASHTO T 180-90.

B. Length of trench open at any one time will be controlled by conditions and subject to any limits that may be prescribed by the Owner's Representative.

C. The Owner's Representative may require that pavement be cut with pneumatic tools, without extra compensation to Contractor, where in the opinion of the Engineer it is necessary in order to prevent damages to the remaining road surface. Where pavement is removed in large pieces, dispose of pieces before proceeding with excavation.

D. Installation of well point and pump done shall be under supervision of a competent representative of the Contractor.

E. There may be pipes, drains, and other utilities in certain locations not indicated on drawings; no attempt has been made to show all services, and completeness or accuracy of information given is not guaranteed.

F. All existing pipes, poles, wires, fences, curbing, property line markers, and other structures that the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the Contractor. Should such items be damaged, they shall be restored by the Contractor, without compensation, to at least as good condition as that in which they were found immediately before the work was begun.

G. Whenever the Contractor encounters certain existing structures as described below and is so ordered in writing, he shall do the whole or such portions of the work as he may be directed to change the location of, remove and later restore, or replace such structures, or to assist the Owner thereof in so doing. For all such work the Contractor shall be paid under such items of work as may be applicable, otherwise as Extra Work.

H. In removing existing pipes or other structures, the Owner's Representative shall include for payment only those new materials which, in his judgment, are necessary to replace those unavoidably damaged.

I. The structures to which the provisions of the preceding two paragraphs shall apply include pipes, wires, and other structures which meet all the following: (a) are not indicated on the drawings or otherwise provided for, (b) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (c) in the opinion of the Owner's Representative will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

J. Branches, limbs and roots shall not be cut except by permission of the Owner's Representative.

K. Restoration of existing property or structures done as promptly as practicable and not left until the end of the construction period.

L. If material unsuitable for foundation (in the opinion of the Owner's Representative) is found at or below the grade to which excavation would normally be carried in accordance with the drawings and/or specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, screened gravel, select bank-run gravel, fine aggregate or concrete as directed.

M. No excavation materials shall be removed from the site of the work or disposed of by the Contractor except as directed or permitted.

N. Surplus excavated materials not needed as specified above shall be hauled away and dumped by the Contractor, at his expense, at appropriate locations, and in a legal manner.

O. During progress of work, Contractor shall conduct his operations and maintain area of these activities, including sweeping and sprinkling of streets as necessary, so as to minimize the creation

and dispersion of dust.

P. In general, and unless other material is indicated on drawings or specified, material used for backfilling trenches and excavation around structures shall be suitable material which was removed in the course of making the construction excavations. If sufficient suitable material is not available from the excavations, the backfill material shall be screened gravel, bank-run gravel or selected borrow as directed.

Q. The nature of materials will govern both their acceptability for backfill and methods best suited for their placement and compaction in backfill.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material whether from excavation or from borrow, after being placed and properly compacted, shall make a dense stable fill containing no vegetation, masses of roots, individual roots more than 18 in. long or more than ½" in diameter, stones over 6 in.

B. Wellpoints shall be designed especially to drain soil and prevent saturated soil from flowing into excavation.

C. Pumping unit shall be designed for use with wellpoints and capable of maintaining high vacuum and handling large volumes of air and water at the same time.

D. Use Class B concrete, screened gravel, select bank-run gravel, fine aggregate, selected borrow.

E. Select bank-run gravel shall contain not more than 10 percent material passing a 200 sieve.

PART 3 - EXECUTION

3.01 DESCRIPTION:

A. Carry out program of excavation, dewatering, sheeting, and bracing in such manner as to eliminate all possibility of undermining or disturbing foundation of existing structures or of work previously completed under this contract.

B. Excavate to widths that give suitable room for building structures or laying and jointing piping; furnish and place all sheeting,

bracing, and supports; do all cofferdamming, pumping, and draining; and render bottom of excavations firm and dry and acceptable in all respects.

C. Do not plow, scrape or dig by machinery, earth near to finished subgrade so as to result in disturbances of material below subgrade, unless indicated or specified, and remove with pick and shovel, material to be excavated, just before placing pipe, masonry or other structure.

D. Make all excavation in open, except as otherwise specified or permitted.

3.02 SEPARATION OF SURFACE MATERIALS:

A. Remove only such parts of existing pavement that are necessary for prosecution of work.

B. Carefully remove loam and topsoil from excavated areas; store separately for further use or furnish equivalent loam and topsoil as directed.

3.03 DRAINAGE:

A. Provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations. Keep such excavations dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.

B. Dispose of all pumped or drained water without undue interference to other work, damage to pavements, other surfaces, or property. Provide suitable temporary pipes, flumes, or channels for water that may flow along or across the site of work.

1. Temporary Underdrains: Lay temporary underdrains, when used, in trenches beneath grade of structure. Provide trenches to accommodate underdrain and surrounding gravel. Lay underdrains at suitable distance below bottom of normal excavation with open joints wrapped in cheesecloth, and entirely surrounded by graded gravel or crushed stone to prevent the admission of sand or other soil into the underdrains. Distance between bottom of pipe at least 3 in. unless otherwise permitted. Space between underdrain and pipe or structure shall be filled with screened gravel of crushed stone, rammed if necessary, and left with a surface suitable for

laying pipe or building structure.

2. Drainage Wellpoint System: Dewater excavation, if necessary, by an efficient drainage wellpoint system that will drain soil and prevent saturated soil from flowing into excavation. Provide special work such as surrounding wellpoint with sand or gravel or other work necessary for wellpoint system to operate for successful dewatering of excavation.

3.04 TRENCH EXCAVATION:

A. Excavate trench by machinery to, or just below designated subgrade, where pipe is to be laid in gravel bedding or concrete cradle, provided that material remaining at bottom of trench is only slightly disturbed.

B. Do not excavate lower part of trenches by machinery to subgrade, where pipe is to be laid directly on bottom of trench. Remove last of material to be excavated by use of hand tools, just before placing of pipe. Form a flat or shaped bottom, true to grade, so that pipe will have a uniform and continuous bearing. Support on firm and undisturbed material between joints, except for limited areas where use of pipe slings have disturbed bottom.

3.05 DEPTH OF TRENCH:

A. Excavate trenches to depths as to permit pipe to be laid at elevations, slopes or depths of cover indicated on Drawings, and at uniform slopes between indicated elevations.

3.06 WIDTH OF TRENCH:

A. Make pipe trenches as narrow as practicable, being careful not to widen them by scraping or loosening materials from the sides. Make every effort to leave deep sides of trenches firm and undisturbed until backfilling has been completed and consolidated.

B. Excavate trenches with approximately vertical sides between elevation of center of pipes and elevation 1 ft. above top of pipe.

3.07 TRENCH EXCAVATION FILL:

A. Place material to top of fill or to a minimum height of 1 ft. above the top of pipe, whichever is less, when pipe is to be laid in embankment or other recently filled material. Take particular care to ensure maximum consolidation of material under pipe locations. Excavate pipe trench as though in undisturbed material.

3.08 EXCAVATION NEAR EXISTING STRUCTURES:

A. Discontinue digging by machinery where excavation approaches pipes, conducts, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation, in work to be done, when incidental to normal excavation and under items involving normal excavation.

3.09 CARE AND RESTORATION OF PROPERTY:

A. Enclose uncut tree trunks adjacent to work in wooden boxes of such height as may be necessary for protection from injury from piled material, equipment, operations, or otherwise due to work. Excavation machinery and cranes shall be of suitable type, and operated with care to prevent injury to trees not to be cut and particularly to overhanging branches and limbs.

B. All branch, limb, and root cuttings shall be made smoothly and neatly without splitting or crushing. Cut or injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed, when unavoidable injury or cutting to branches.

C. Protect cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations by suitable means or dug up and temporarily replanted and maintained. After construction operations have been substantially completed, replant in original positions and care for until growth is reestablished. If cultivated hedges, shrubs and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, replace by items equal of the kind and quality existing at the start to the work.

D. Do not use or operate tractors, bulldozers, or other power operated equipment on paved surfaces when treads or wheels of which are so shaped as to cut or otherwise injure such surfaces.

E. Restore all surfaces which have been injured by the Contractor's operations, to a condition at least equal to that in which they were found immediately before work commenced. Suitable materials and methods shall be used for such restoration.

3.10 UNAUTHORIZED EXCAVATION:

A. Backfill, when bottom of any excavation is taken out beyond limits indicated or prescribed and without additional compensation, with thoroughly compacted, screened gravel, if the excavation is for a

pipelines, or with Class B concrete, if the excavation is for a masonry structures.

3.11 DISPOSAL OF SURPLUS EXCAVATED MATERIALS:

A. Use surplus excavated materials suitable for backfill to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill; deposit neatly and grade so as to make or widen fills; flatten side slopes, or fill depressions; or dispose of them legally.

3.12 FILL AND BACKFILL UNDER STRUCTURES:

A. Compact all fill and backfill under structures and pavements adjacent to structures with select bank-run gravel or coarse aggregate and fine aggregate when indicated.

B. Place fill and backfill materials in layers not exceeding 6 in. in thickness. Unless otherwise indicated or specified, each layer shall be compacted to 95 percent.

3.13 BACKFILLING PIPE TRENCHES:

A. Start backfilling and proceed until complete as soon as practicable after the pipes have been laid and the joints have acquired a suitable degree of hardness, if applicable, or structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected.

B. Do not backfill trenches at pipe joints until after section of pipeline has successfully passed any specified test required. Should Contractor wish to minimize maintenance of lights and barricades and obstruction of traffic, he may, at his own risk backfill the entire trench, omitting or including backfill at joints as soon as practicable after the joints have acquired a suitable degree of hardness, if applicable, and related structures have acquired a suitable degree of strength.

Remove and later replace such backfill, at own expense, in order to locate and repair or replace leaking or defective joints or pipe.

1. Material: Do not place stone or rock fragment large than 6 in. in backfill nor drop large masses of backfill material into trench in such a manner as to endanger the pipeline. See trench details on the Drawings. Exclude pieces of bituminous pavement from the backfill unless use is expressly permitted, in which case break as directed.

2. Zone Around Pipe: Backfill zone around the pipe with materials and limits indicated on drawings. Material shall be compacted to 90 percent of maximum density by tamping.

3. Remainder of Trench: Compact trench above zone around pipe, by water-jetting, puddling, or tamping, in accordance with nature of material and compaction requirements. Water-jetting or puddling may be used wherever the material does not contain so much clay or loam as to delay or prevent satisfactory drainage. However, use tamping if water-jetting or puddling does not compact material to density required.

4. Water-jetting:

    a. Compact material by water-jetting, if necessary, by placing jet pipes in trench and saturating throughout its full depth and at frequent intervals across and along trench until all slumping ceases. To accomplish this, furnish one or more jet pipes, each of sufficient diameter (not less than 1-1/4 in.) to supply an adequate flow of water to compact material. Equip jet pipe with a quick-acting valve, supplied through a fire hose from a hydrant or a pump having adequate pressure and capacity.

5. Puddling:

    a. Deposit water material of sufficient depth, if backfill is to be compacted by puddling, so that material will be submerged when in place.

        Compact, by tamping, dams or dikes constructed in trench to hold water used for puddling as specified below.

6. Tamping:

    a. Before compaction, deposit and spread material in uniform parallel layers not exceeding 8 in. thick when compacted by tamping or, under appropriate circumstances, rolling. Before next layer is placed, tamp each layer as required to obtain a thoroughly compacted mass. Take care that material close to bank, as well as in all other portions of trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed make it feasible, and it can be done effectively without damage to the pipe, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping (or rolling), rate at which backfilling material is

deposited in trench shall not exceed that permitted by facilities for its spreading, with leveling, and compacting furnished by Contractor.

b. Wet material by sprinkling when necessary to ensure proper compaction by tamping (or rolling). However, no compaction by tamping (or rolling) shall be done when material is too wet either from rain or too great an application of water to be compacted properly; at such times suspend work until previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions taken as may be necessary to obtain proper compaction.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

RELATED DOCUMENTS: Drawings and general provisions of Contract Documents, including General and Supplementary Conditions.

1.01 DESCRIPTION OF WORK:

A. Work Includes:

Asphaltic pavement required for this Work is indicated on the Drawings and includes:

1. Final preparation of subgrade.
2. Mineral aggregate base course.
3. Asphalt surfacing materials.
4. Parking lines, traffic lines and handicap symbols.
5. Car Stops

B. Type of Asphaltic Pavement:

Asphaltic pavement shall be Full Depth (Black Base) Bituminous Pavement type.

1.02 QUALITY ASSURANCE:

Provided personnel who is thoroughly trained and experienced in the skills required and who are familiar with the design and application of work described for this Section and who shall direct all work performed under this Section.

1.03 SUBMITTAL:

Submit a job mix formula indicating definite percentage of each sieve fraction, percentage of bitumen and temperature of mix as discharged from mixer.

1.04 PRODUCT HANDLING:

A. Use all means necessary to protect asphaltic concrete pavement materials before, during and after installation and to protect the installed work and materials of all other trades.

B. In the event of damage, immediately make all repair and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.05 DUST CONTROL:

Use all means necessary to prevent spread of dust during performance of the work of this Section. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of other work on the site.

PART 2 - PRODUCTS

2.01 ASPHALTIC PAVEMENT:

A. The following materials shall conform with the requirements of the American Society for Testing and Materials (ASTM), as follows:

1. Mineral filler for bituminous paving mixtures shall conform to ASTM D-242.

2. Coarse aggregate for bituminous paving mixture shall conform to ASTM D-692.

3. Asphalt cement for use in pavement construction shall conform to ASTM D-946.

4. Fine aggregate for bituminous paving mixtures shall conform to ASTM D-1073.

5. Resistance to plastic flow of bituminous mixtures shall conform to ASTM D-1559.

6. Hot-mixed, hot-laid asphalt paving mixture shall conform to ASTM D-1663.

7. Coating and stripping of bitumen-aggregate mixtures shall conform to ASTM D-1664.

B. Mix composition for base course shall be Type IV-d and for surface course shall be Type IV-b, in accordance with Specifications 401 of the Puerto Rico Highway and Transportation Authority.

2.02 TRAFFIC PAINT:

Traffic paint for parking lines, traffic lines and symbols and handicap symbols shall be equal to Romark Crosswalk Paint as manufactured by Glidden Corporation conforming to Federal Specification TT-P-115; white, yellow, or blue (for handicap signs) color as directed.

2.03 CAR STOPS:

Car stops shall be precast 6'0" long, 6" high with two 3/4" diameter x 10" long anchor bolts as detailed on drawings.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS:

Prior to all work of this Section, inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Verify that asphaltic pavement may be installed in strict accordance with the design and all pertinent codes, regulations and standards. In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 FINAL PREPARATION OF SUBGRADES:

A. After preparation of subgrades, thoroughly scarify and sprinkle the entire area to be paved and then compact by rolling to a smooth, hard, surface of 90% compaction to receive the base course.

B. Finish to the required grades with due allowance for the thickness of base course and finished surfacing to be placed thereon.

3.03 EQUIPMENT:

All equipment for compacting shall be self-propelled tandem rollers having a minimum weight of ten tons, except that hand-held vibrator compactors may be used in areas not accessible to rollers when approved by the Owner.

3.04 TRANSPORTATION:

A. Mixture shall be transported from the paving plant to the site in trucks having tight, clean, smooth beds. Each load shall be covered to protect it from the weather and to prevent the loss of heat.

B. Deliveries shall be made so that spreading and rolling of all the mixture prepared for a day's run can be completed during daylight.

C. The mixture shall be delivered to the area to be paved in such manner that the temperature at the time of dumping will not be less than 225 degrees Fahrenheit. Any load wet excessively by rain will be rejected.

3.05 PLACEMENT:

A. After completion of subgrade operations, place the specified base course to the thickness shown on Drawings.

B. Placing shall begin at center line of crowned sections and at high side of one-way slope section.

C. Spreading and rolling shall be as continuous as possible.

D. Joints shall present same texture, density and smoothness as other sections of the course. Joints in base course shall not coincide with joints in surface course.

E. After the base course is placed, compacted and approved the surface course shall be spread and rolled in a continuous operations.

3.06 COMPACTION:

A. Start rolling as soon as mixture will bear roller without undue displacement.

B. Compact from sides to center, overlapping by at least one-half the width of rear wheel on successive trips. Alternate trips shall be of slightly different lengths.

C. Any displacement of mixture shall be corrected at once by rakes or mixture removed and fresh mixture added as required.

D. In areas inaccessible to rollers the use of mechanical or hand tampers may be used.

E. Compaction shall continue until roller marks are eliminated, smooth and unyielding surface and true to the thickness and elevations shown on Drawings.

F. Trim all edges neatly.

3.07 TESTING AND SAMPLING:

A. All sampling and testing shall be performed by a well recognized laboratory chosen by the Owner.

B. All sampling and testing shall be paid by the Contractor.

C. Samples of plant mixtures shall be taken and tested for each day's placing, unless otherwise directed.

D. Tests:

1. Smoothness tests shall be performed after rolling each course with a ten (10) foot straight edge. Irregularities greater than ¼" in ten feet in base course and 1/8" in ten feet in surface course, shall be corrected.

2. Test to determine gradation and bitumen content shall be performed on samples taken from the plant mixtures as required in paragraph 3.07-A above.

3. Tests to determine the thickness of base course and surface course shall be made by three (3) inches diameter test holes; at least one test for each 200 square yards or fraction of each course.

4. Compaction test to determine the density shall be made and shall be at least 96% of a laboratory specimen of the same mix when subjected to 50 blows each end to specimen in the Marshall mold.

3.08 TRAFFIC PAINT:

A. Thoroughly clean the surface area where traffic paint is to be applied following the paint manufacturer's recommendation.

B. Apply all traffic lines and signs on pavements, gutters, drive-ways, ramps, walks and parking areas as directed and as shown on Drawings.

C. All lines shall be at least 3" wide unless indicated otherwise, and shall be applied with stencils or making machines as approved.

D. The paint manufacturer's instructions shall be followed throughout the painting process.

3.09 CAR STOPS:

Car stops shall be provided at all parking spaces, and as indicated on drawings.

3.10 CLEANING:

A. Upon completion of each day's work all immediate adjacent areas shall be cleaned of all excess materials and dirt and all stain promptly removed.

B. Upon completion of all work of this Section, remove from the job site all excess materials, debris, mixture dropping and all tools and equipment leaving all areas in a neat and orderly condition to the approval of the Architect.

END TO SECTION

SECTION 32 92 00

TURF AND GRASSES

PART 1: GENERAL

1.01 DESCRIPTION

Restore all disturbed grass and landscaped areas to conditions equal to or better than before the work began and to the satisfaction of AW.

1.02 SUBMITTALS

A. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section

2. Specifications and other data required to demonstrate compliance with the specified requirements.

B. Pre-Construction Photos

1. Provide pre-construction photos of the existing conditions prior to disturbance of proposed areas of construction.

1.03 GUARANTEE

A. If a satisfactory stand of lawn/grass has not been produced, the Contractor shall renovate and reseed the lawn and unsatisfactory portions thereof immediately or during the next planting season if proper weather conditions do not exist for germination. A satisfactory stand is defined as a section of lawn that has:

1. No bare spots larger than 3 square feet.

2. Not more than 10 percent of total area with bare spots larger than 1 square foot.

PART 2: PRODUCTS

2.01 TOPSOIL

Topsoil shall not contain more than 40 percent clay in that portion passing a No. 10 sieve. Topsoil shall contain between 5 percent and 20 percent organic matter as determined by loss on ignition of samples oven-dried to constant weight at 212°F.

2.02 FERTILIZER

A soil test shall be conducted to determine grade and the proper amount of lime and fertilizer to apply. In general, fertilizer shall be applied at a rate of 11 pounds per 1,000 square feet of 10-10-10 or equivalent with 50% water insoluble nitrogen unless indicated otherwise by the soil tests. Fertilizer must be slow release or applied in two applications, half at time of planting and the second half after permanent seed germinates.

2.03 SEED AND SOD

A. SOD

Where sod is required it shall be green, freshly cut, and of good quality with grass free from all noxious weeds. It shall contain all the dense root system of the grass and shall not be less than 1-1/2 inches thick.

B. SEED

Seeding Dates: Following dates govern except when environmental conditions warrant, AW may extend seeding dates.

1. Spring: March 1 to June 1
2. Fall: August 1 to October 1

Seed disturbed areas with the following mixture or a mixture as required by the Soil Conservation District or other governing authority.

Species in Mix	Mix Percent by Weight	Min. Percent		Max. Percent Weed Seed
		Purity	Germination	
Red Fescue Chewings	30	95	85	0.50
Kentucky Bluegrass (Blend)	50	85	80	0.40
Red Top	3	90	90	0.75
Perennial Rye Grass	17	90	90	0.50

2.04 SOIL EROSION CONTROL BLANKETS

When or if required for use, soil erosion control blankets shall be machine produced mat of wood excelsior formed from a web of interlocking wood fibers, covered on one side with either plastic netting or twisted Kraft paper cord netting. Soil erosion control blankets shall not be installed on flat surfaces or sloped surfaces up to and including 10:1 slopes. Soil erosion control blankets shall be used on surfaces with a slope greater than 10:1 as per manufacturer's installation guidelines.

2.05 MULCH

Mulch shall be straw reasonably free of weed seed and foreign materials which may affect plant growth for all hand and straw blower applications. Paper or cellulose mulch is required for hydro seeding. Other materials may be used if approved by AW.

PART 3: EXECUTION

3.01 PREPARATION OF SEED BED

A. Topsoil Areas

Topsoil shall be replaced with adequate amounts of topsoil material to restore the disturbed area to its original pre-disturbance grade and depth of topsoil but not less than 4 inches.

Remove store, and use suitable topsoil available from the excavated material to backfill the excavation. Remove and dispose of all imported granular fill, grass, weeds, roots, sticks, stones, and other debris 1-inch or greater in diameter. Bring the topsoil to the finished grade by raking.

When there is insufficient topsoil available from the site excavated materials, furnish 4 inches of topsoil to be used as a seed bed in lawn areas as described in, Paragraph Part 2.01 of this Section or clearly marked as lawn areas on the plans.

B. Non-topsoil Areas

The trench backfill may be used as a seed bed, where approved by AW or in areas clearly marked on Drawings that are not considered lawn areas. After the backfill has been given a reasonable time to settle, grade it off to the finished grade and harrow to a depth of 3 inches. Remove and dispose of all grass, weeds, roots, sticks, stones and other debris 1 inch or greater in diameter.

3.02 FERTILIZING

Lime and fertilizer will be worked into the top 4 inches of soil prior to seeding and are generally applied at 500 lbs/acre (11 lbs/1000 sq).
Adjust rates as determine by soil test.

3.03 SEEDING

Seed immediately after preparation and fertilization of the seed bed. Mix the seed thoroughly and sow it evenly over the prepared areas at the rate specified in Paragraph 2.03. Sow the seed dry or hydraulically. After sowing, rake or drag the area to cover the seed to a depth of approximately 1/4 inch.

3.04 SODDING

Sod all areas as noted in the Drawings. As a minimum, sod shall be fibrous, well rooted approved grass type. The grass shall be cut to a height of less than 3-inches. Edges of sod shall be cleanly cut, either by hand or machine, to a uniform thickness of not less than one and 1-½-inches, to a uniform width of not less than 16-inches, and in strips of not less than 3-feet in length. Sod shall be free from all primary noxious weeds.

Lay sod with tight staggered joints. On slopes, start placement at the foot of the incline. Use wood pegs driven flush to hold sod in place on slopes 4:1 or greater. Use two wood pegs per strip of sod. Roll the sod lightly after placement. Fill any open joints with topsoil and/or sod.

Around walkways, driveways, grass or other existing borders, remove sufficient soil so that the surface of the sod will be level with the existing surfaces and won't pose a tripping hazard.

3.05 MULCHING

Place mulching material evenly over all seeded areas within 48 hours of seeding. Straw mulch must be applied at a rate of 1-1/2 to 2 tons per acre when a liquid mulch binder is used. When a crimper is used instead of liquid mulch binder, the rate of application is 3 tons per acre. Paper and cellulose mulch shall be applied at a rate of 1,500 pounds per acre (Or as recommended by the product manufacturer). Mulch must be applied in accordance with the New Jersey Soil Erosion and Sediment Control Manual, Standard for Permanent Vegetative Cover for Soil Stabilization.

3.06 HYDRO SEEDING

Equipment shall be a commercial-type Hydro-Seeder and have a built-in agitation system with an operation capacity sufficient to agitate, suspend and homogeneously mix slurry. Distribution lines shall be large enough to prevent stoppage and allow even distribution of slurry over the site by generating 150 psi at the nozzle.

Water and fertilizer shall be added first with the seed added last. Mulch shall not be included in the tank with seed. Once fully loaded, the complete slurry shall be agitated for 3-5 minutes to allow for uniform mixing prior to application. The application rate for hydroseeding requires AW's prior approval.

All hydro seed applications are to be applied in a sweeping motion to form a uniform application.

3.07 LANDSCAPED AREAS

Restoration of landscaped areas including plantings, shrubbery, and trees shall be performed in-kind and coordinated with the AW Project Manager prior to planting.

3.08 MAINTENANCE

Carefully maintain, tend, and water all seeded and sodded areas necessary to secure a good, well-established turf. Fill, grade, and reseed or re-sod all areas that have settled. Maintain the condition of the sodded areas for a period sufficient for the grass to root into the topsoil.

END OF SECTION 32 92 00

SECTION 33 31 00
SANITARY SEWERAGE PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. General:

1. All sanitary sewer improvements on the Owner's property shall be in accordance with the Plans, Section 33 31 00 of these specifications, and the Oregon Plumbing Specialty Code (OPSC).

2. Where there is a conflict between requirements, the order of hierarchy shall be: Oregon Plumbing Specialty Code, the Plans, Section 33 31 00 of these specifications, and other referenced Sections from these specifications, unless otherwise directed by the Owner's Representative. The Contractor shall notify the Owner's Representative of any conflicts or discrepancies prior to bidding.

3. All materials and methods for sanitary sewer improvements constructed in the public right of way or in city easements shall be in accordance with the City of Redmond 2010 Standards and Specifications.

B. Section Includes private sanitary sewerage systems outside the building, including:

1. Pipe and fittings for non-pressure systems

2. Cleanouts

C. RELATED SECTIONS

1. Section 03 30 00 (03300) - Cast-in-Place Concrete

2. Section 31 20 00 (02300) - Earth Moving

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Non-pressure Piping Pressure Ratings: At least equal to system test pressure

1.04 QUALITY ASSURANCE

A. Environmental Agency Compliance: Comply with regulations pertaining to sanitary sewerage systems for the Oregon Plumbing Specialty Code, the Oregon Health Division, and the Oregon Department of Environmental Quality.

B. Utility Compliance: Comply with the governing agency's regulations pertaining to sanitary sewerage.

1.05 DEFINITIONS

A. Governing Agency: City of Redmond (Building Department).

B. Gravity Sewerage Piping: system of sewer pipe, fittings, and appurtenances for gravity flow of sanitary sewage.

1.06 SUBMITTALS

A. General: Submittals shall be in accordance with the Conditions of the Contract and Division 01 Specifications.

B. Product data for the following, but not limited to:

1. Sewerage pipe and fittings

2. Cleanouts, frames, and covers

3. Cleanout plugs

C. Product Certificates: For each type of pipe and fitting, from manufacturer.

D. Field quality control reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

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

1.08 PROJECT CONDITIONS

A. Indicated locations of existing utilities and structures are approximate. Call for underground utility locates and verify existing utility locations before commencing work. Locate existing structures and piping to be closed and/or abandoned.

B. Traffic Control: 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 the Owner's Representative.

2. Provide alternate routes around closed or obstructed pedestrian and traffic ways, as required by the Owner's Representative or the governing agencies, including temporary ADA accessibility.

C. Verification: Verify that sewer system piping shall be installed in compliance with original design and referenced standards.

D. Site Information: Reports on subsurface condition investigations made during the design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between test pits). Owner's Representative assumes no responsibility for interpretations or conclusions drawn from this information.

E. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by the Owner or others unless permitted under the following conditions and

then only after arranging to provide temporary water distribution service according to requirements indicated:

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

1.09 SEQUENCING AND SCHEDULING

A. Coordinate connection to existing sewer mains with City of Redmond.

B. Coordinate connections to private sewer mains with the Owner's Representative.

C. Coordinate with pipe materials, sizes, and entry locations of building drainage systems.

D. Coordinate with other utility work.

PART 2 PRODUCTS

2.01 SUMMARY

A. GENERAL

1. Product material types are as indicated on the plans, unless otherwise noted.
2. All products submitted for approval shall be listed on ODOT's Qualified Products List (QPL), or an approved equal, unless otherwise directed.

2.02 PVC PIPE AND FITTINGS A.

PVC Gravity Sewer Piping:

1. Pipe and Fittings:
   a. NPS 4 to NPS 15: ASTM D3034 SDR 35 with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints
   b. NPS 18 to NPS 36: ASTM F679, 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. Primer, Solvents, Cement, and Gaskets for PVC Pipe and Fittings:
   a. Primer: ASTM F656
   b. Solvent Cement: ASTM D2564.
   c. Gaskets: ASTM F 477, elastomeric seal.

2.03 NON-PRESSURE TYPE TRANSITION COUPLINGS

A. Sleeve-Type Couplings: Comply with ASTM C1173, rubber or elastomeric sleeve-type reducing or transition coupling, fabricated to match outside diameters of pipes to be joined, and including at least one stainless steel band at each pipe insert.

1. For Cast-Iron Soil Pipes: ASTM C564, rubber.
2. For Concrete Pipes: ASTM C 443, rubber.
3. For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
4. For Dissimilar Pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.

B. Gasket-Type Pipe Couplings: Rubber or elastomeric compression gasket, made to match outside diameter of smaller pipe and inside diameter or hub of adjoining larger pipe, for nonpressure joints.

1. For Cast-Iron Soil Pipe: ASTM C564, rubber.
2. For Plastic Pipes: ASTM F477, elastomeric seal.
3. For Dissimilar Pipes: Compatible with pipe materials being joined. C. Unshielded, Flexible Couplings:

1. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistantmetal tension band and tightening mechanism on each end. D. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring. E. Nonpressure-Type, Rigid Couplings:

1. General: Should not be used for liquids at temperatures below 0 degrees Fahrenheit or above 130 degrees Fahrenheit.
2. Description: ASTM C1461, sleeve-type, reducing- or transition-type mechanical coupling, molded from ASTM C1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.04 CLEANOUTS

A. Cleanouts shall be in accordance with the Plans and Uniform Plumbing Code requirements. Where not indicated, the following requirements shall apply. Shop drawings shall be submitted to the Architect for approval prior to installation. B. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, cast-iron housing with clamping device and round, secured, scoriated, cast-iron cover. Include cast-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Cleanouts in Vehicle-Traffic Service Areas: Use Heavy-Duty, top-loading classification cleanouts.
3. Cleanouts in Earthen Areas: Use Medium-Duty, top-loading classification cleanouts.

4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

C. PVC Cleanouts:

1. Riser Pipe and Fittings: Riser pipe and fittings of same material as sewer piping.

2. Frame and Cover: Part No. M-1018 by Olympic Foundry or Engineer-approved equal.

3. Plug: PVC threaded plug

PART 3 EXECUTION

3.01 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

C. Cut pipe ends square, ream pipe and tube ends and remove burrs.

D. Remove scale and dirt, on inside and outside, before assembly.

E. Prepare pipe for connections to equipment with flanges or unions.

F. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.02 EARTHWORK

A. Refer to Section 31 20 00 (02300) - Earth Moving for general excavating, trenching, and backfilling requirements.

B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, each layer. Place compacted bedding material to elevation of paving subgrade as indicated on Drawings.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

D. Identification

1. Identification materials and their installation are specified in Section 31 20 00 (02300) - Earth Moving. Arrange for installation of the following:

a. Use green warning tape directly over piping and at outside edges of underground structures.

b. Use detectable warning tape over ferrous piping.

c. Use detectable warning tape and wire over nonferrous piping and over edges of underground structures. Extend detectable warning tape and wire into manholes.

3.03 PIPING INSTALLATION

A. Sewer system piping shall be provided where indicated on the Plans, and shall be installed in accordance with the OPSC requirements. Where not indicated, the following requirements shall apply.

B. 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.

C. 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. Maintain swab or drag in line and pull past each joint as it is completed.

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 tunneling, jacking, or a combination of both.

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

1. Extend sewerage piping and connect to building’s sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

2. Install gravity-flow-systems piping at constant slope between points and elevations indicated.

3. Where no slope is indicated, install piping runs pitched down in direction of flow, at a minimum slope of 1 percent for NPS 6 and larger, and 2 percent for NPS 4 and smaller, unless otherwise directed.

4. Install piping with 12-inch minimum cover below the subgrade, unless otherwise indicated or directed.

5. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

6. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

7. Install ductile-iron, gravity sewer piping according to ASTM A 746.

8. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.

9. Install PVC cellular-core sewer piping according to ASTM D 2321 and ASTM F 1668.

10. Install PVC corrugated sewer piping according to ASTM D 2321 and ASTM F 1668.

11. Install PVC profile sewer piping according to ASTM D 2321 and ASTM F 1668.
12. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.
13. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
14. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.04 JOINT CONSTRUCTION

A. Pipe joints shall be provided where indicated on the Plans, and shall be installed in accordance with the OPSC requirements. Where not indicated, the following requirements shall apply.

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

1. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
4. Join ductile-iron, gravity sewer piping with ductile-iron or cast-iron fittings according to AWWA C600 for push-on joints with rubber gaskets.
5. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomericseal joints.
6. Join PVC cellular-core sewer piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
7. Join PVC corrugated sewer piping according to ASTM D 2321.
8. Join PVC profile sewer piping and ribbed drain pipe with gasketed fittings according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
9. 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.
10. 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.
11. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
12. Join solvent-cement-joint pipe and fittings with solvent cement according to ASTM D2855 and ASTM F 402.
13. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

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.

D. Use non-pressure flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.

1. Unshielded flexible couplings for pipes of same or slightly different OD.

2. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.

3. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

E. System Piping Joints: Make joints using system manufacturer’s couplings, except where otherwise specified.

F. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and fit both systems’ materials and dimensions.

3.05 CLEANOUT INSTALLATION

A. Cleanouts shall be provided where indicated on the Plans, and shall be installed in accordance with the OPSC requirements. Where not indicated, the following requirements shall apply.

B. 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 PVC or cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

C. Cleanouts in Vehicle-Traffic Service Areas: Use Heavy-Duty, top-loading classification cleanouts. Set cleanout frames and covers with tops flush with pavement surface.

D. Cleanouts in Earthen Areas: Use Medium-Duty, top-loading classification cleanouts. Set cleanout frames and covers in cast-in-place-concrete block, 18 by 18 by 6 inches deep. Set with tops 6 inches above surrounding earth grade, unless otherwise directed.

3.06 CONNECTIONS

A. Connections shall be provided where indicated on the Plans, and shall be installed in accordance with these Specifications. Where not indicated, the following requirements shall apply.

B. Connect non-pressure, gravity-flow drainage piping to building's sanitary building drains as specified on the Plans and in accordance with Division 22 Section "Sanitary Waste and Vent Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground structures as follows:

1. Finished work shall conform as nearly as practical to requirements specified for new work.

2. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping.

3. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping.

4. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting opening into existing unit large enough to allow 3 inches of non-shrink grout 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, in accordance with Division 03 Section “Cast-In-Place Concrete.”

   b. Use epoxy-bonding compound, in accordance with Division 03 Section “Cast-InPlace Concrete” at interface between new and existing concrete and piping materials.

5. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Connect to grease, oil, sediment, and sand interceptors as shown on the Plans.

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

1. Use non-pressure-type flexible couplings where required to join gravity-flow, nonpressure drainage 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.

3.07 CLEANING

A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

B. Flushing materials are not allowed to enter active sanitary sewer.

3.08 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as the work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and whenever work stops.
3. Flush piping between manholes and other structures, if required by authorities having jurisdiction, to remove collected debris.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:
a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of actual inside pipe diameter (see “Deflection Test for PVC Pipe” below).
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

C. Testing of new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects per UPC requirements and as follows.
1. Schedule tests and inspections with Owner’s Representative or Owner’s Representative with at least 24 hours' advance notice.
2. Submit separate report for each test.
3. Do not put into service before inspection and approval.
4. Pipe Testing of Gravity Sewers:
a. A test shall be conducted on the first section of pipe laid to establish that the pipe line material is capable of preventing infiltration and that the lines are being installed

to insure that infiltration of ground water will not be greater than amounts set forth herein.
b. Section of pipe lines tested shall be at least 300 feet in length.

c. If test indicates infiltration exceeding amount hereinafter set forth, defective material or workmanship shall be corrected and test rerun until leakage is within the amount specified.

d. For acceptance of installation, all testing must be conducted under observation of the Owner's Representative. Additional tests shall be made as often as the Owner's Representative deems necessary to insure leakage is being held within limits specified.

5. Low Pressure Air Testing of Gravity Sewers:

a. Test sanitary sewerage according to requirements of the UPC, UNI-B-6, and the following:

1) Option: Test plastic gravity sewer piping according to ASTM F 1417.

2) Option: Test concrete gravity sewer piping according to ASTM C 924.

b. Contractor shall furnish all facilities and personnel for conducting test under the observation of the Owner's Representative.

c. Contractor may desire to make air test prior to backfilling for his own purposes. However, acceptance air test shall be made after backfilling has been completed and compacted.

d. The first section of pipe not less than 300 feet in length installed shall be tested in order to qualify.

e. Immediately following pipe cleaning, the pipe installation shall be tested with low pressure air. Air shall be slowly supplied to the plugged pipe installation until internal air pressure reaches 4.0 pounds per square inch greater than the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding.

f. The pipeline shall be considered satisfactory if the time required in seconds for pressure to decrease from 4.0 to 3.5 pounds per square inch greater than the average back pressure of any ground water that may submerge pipe is not less than that computed according to Uni Bell Standards, latest edition, and to the following table entitled "Duration for Air Test Pressure Drop." Duration of test shall be computed from the table, using length "L" in feet, but not less than "minimum time" listed in the table.

DURATION FOR AIR TEST PRESSURE DROP

Pipe Size (Inches)	Duration (seconds)	Minimum Time (minutes)
4	0.190 L	2

6	0.427 L	3
8	0.760 L	4
10	1.187 L	5
12	1.709 L	6
15	2.671 L	7

g. If installation fails requirements, contractor shall determine source or sources of leakage, and shall repair or replace all defective materials or workmanship. Completed pipe installation shall meet requirements of test, before being considered acceptable.

6. Television Inspection: Contractor shall conduct an internal television inspection of all installed mainline sewers, with a movable eye internal camera that permits investigation of each lateral connection to the main line. Lines shall be evaluated for compliance with Standard Specifications, and provide a copy of complete color video tape in VCR compatible format for review by the Owner's Representative or Owner's Representative. Inspection shall be conducted by an approved, licensed and bonded technical service, equipped to make an audio-visual record on the tape. A voice accounting of suspected deficiencies shall be made on the sound track. Inspection firm shall provide the Owner's Representative with written record of any problems noted, on a form approved by the Owner's Representative or Owner's Representative, with stationing, and any noted concerns for needed corrective action. Video report and written report shall be submitted to the Owner's Representative, and shall become property of the Government. If defects are noted in the television inspection, repairs shall be conducted to eliminate defects, and lines shall have a new television inspection provided under identical circumstances until all noted deficiencies are corrected.

7. Deflection Test for PVC: In addition to air and television testing, contractor shall perform a deflection test to all sanitary sewers, storm drains and culverts constructed of PVC pipe after the trench backfill and compaction has been completed. The test shall be conducted by pulling an approved solid pointed mandrel or a variable deflection measuring gauge through the completed pipeline. The diameter of the mandrel shall be 95 percent of the actual inside pipe diameter, unless otherwise specified. Testing shall be conducted on a manhole-to-manhole basis, after the line has been completely flushed out with water. Contractor shall locate and repair any sections failing to pass the test and to retest the section, at no expense to the Government.

8. Hydrostatic Tests:

a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water, and maintain such pressure without leakage for at least 15 minutes.

b. Close openings in system and fill with water.

c. Purge air and refill with water.

d. Disconnect water supply.

e. Test and inspect joints for leaks.

D. Leaks and loss in test pressure constitue defects that must be repaired.

E. Replace leaking piping using new materials, and repeart testing until leakage is within allowances specified.

END OF SECTION