



Saddle Creek Fire Rescue

Polk County Board of County Commissioners

Project Manual

0321.42



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**PART C
TECHNICAL SPECIFICATIONS**

SADDLE CREEK FIRE RESCUE

ARCHITECT'S PROJECT NO.: 0321.42

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SECTION 00300

INFORMATION AVAILABLE TO BIDDERS

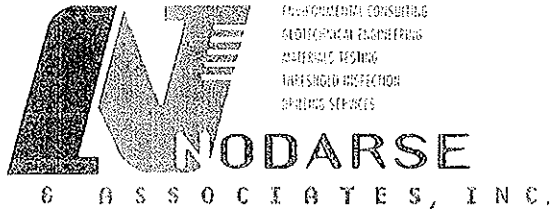
EXISTING REPORTS AND SURVEYS

1.01 SUBSURFACE INVESTIGATION REPORT

- A. A copy of a geotechnical report with respect to the building site is included with this document:
- B. This report identifies properties of below grade conditions and offers recommendations for site preparation, and the design of foundations, prepared primarily for the use of Architect, Engineer, and Contractor.
- C. THE SITE PREPARATION AND FOUNDATION RECOMMENDATIONS DESCRIBED ARE A REQUIREMENT OF THIS CONTRACT.
- D. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

END OF SECTION

Report of Geotechnical Exploration
Reynolds Road Site
Reynolds Road and E. Main Street
Lakeland, Polk County, Florida



July 30, 2008
N&A Project No. 09-08-0005-102A

Mr. Walter Carter
Polk County Board Of County Commissioners
Facilities Management Division
2160 Marshall Edwards Drive
Bartow, Florida 33830-6731

Report of Preliminary Geotechnical Exploration
Reynolds Road Site
Reynolds Road and E. Main Street
Lakeland, Polk County, Florida

Dear Mr. Carter:

Nodarse & Associates, Inc. (N&A) is pleased to present this report of our preliminary geotechnical exploration for the above-referenced project. This exploration was authorized by your acceptance of our proposal dated May 7, 2008. The purposes of this study were to explore subsurface soil conditions at the site and to use the data obtained to evaluate the general suitability of the soils relative to development of the property. This report describes our exploration procedures and presents the data obtained.

PROJECT INFORMATION

The project site comprises approximately 2 acres and is located on the south side of E. Main Street just west of Reynolds Road in Lakeland, Polk County, Florida. We have assumed that the site is being considered for one to two story structures. We have also assumed that column loads will be less than 200 kips, and wall loads less than 6 kips per linear foot.

A review of the United States Geological Survey Lakeland, Florida, Quadrangle map, attached in the Appendix as **Figure 1**, shows that prevailing elevations at the site are approximately +115 to +120 feet, NGVD. Site grades in the project area slope gradually down towards the east. The area to the south of the site appears to be a reclaimed phosphate strip mine. Previous phosphate strip mining in the area may have altered the natural soils within the project site.

A review of the United States Department of Agriculture Soil Conservation Service (SCS) survey for Polk County Florida, attached as **Figure 2** in the Appendix, indicates that soils at the site consist of Sparr sand. According to the survey, Sparr soils consist of sand from the ground

surface to a depth of approximately 57 inches underlain by sandy clay loam to a depth of at least 80 inches. The seasonal high groundwater level is encountered at depths of 20 to 40 inches for 1 to 4 months in most years.

SUBSURFACE EXPLORATION

Our exploration consisted of performing two Standard Penetration Test (SPT) borings to a depth of 20 feet and four hand auger borings to a depth of 5 feet at various locations within the project site. The field testing locations were determined at the site by referencing from existing site features and are shown on the Boring Location Plan, **Figure 3**, in the Appendix.

Standard Penetration Tests were performed continuously in the SPT borings to a depth of 10 feet and at 5-foot depth intervals thereafter. Each sample was removed from the sampler in the field and was examined, packaged, and sealed for transportation to our laboratory for further examination and visual classification. Groundwater levels were measured in the boreholes at the time of our field exploration.

The hand auger boring procedure consisted of manually turning a 3-inch diameter, 6-inch long sampler into the soil until it was full. The sampler was then retrieved and the soils in the sampler were visually examined and classified. The procedure was repeated until the desired termination depth was achieved. Samples of representative strata were obtained for further visual examination and classification in our laboratory.

GENERAL SUBSURFACE CONDITIONS

Subsurface conditions encountered in the borings are shown on the Soil Boring Profiles (**Figure 4**) in the Appendix. Descriptions of the soils encountered in the borings are accompanied by the Unified Soil Classification symbol (SP, SC, etc.) based on visual examination. Stratification boundaries between soil types should be considered approximate as the actual transition between soil types may be gradual.

The SPT and auger borings performed for this exploration encountered fine sands, slightly silty sands, slightly clayey sands, and clayey sands from the ground surface to the boring termination depths of 5 and 20 feet. The relative density of these soils was very loose to medium dense with standard penetration resistance values in the SPT borings ranging between 4 and 11 blows per foot.

The groundwater level was not encountered in two of the hand auger borings to the termination depth of 5 feet but was encountered in the remaining borings at depths of approximately 4.5 to 6 feet below the existing ground surface. Groundwater levels will fluctuate with the amount of rainfall and with site development and, therefore, may be different at other times. Based on the

SCS survey and the results of our exploration, we estimate the seasonal high groundwater level will be encountered at depths of approximately 2 to 3 feet below the existing ground surface.

PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

The following preliminary recommendations are based on the project characteristics previously described, the data obtained in our field exploration, and our experience with similar subsurface conditions and construction types. A final geotechnical exploration consisting of additional borings should be performed once further information is developed regarding structure loads and locations.

The results of this preliminary geotechnical exploration indicate that the existing soils are suitable to support the assumed structure loads on a shallow foundation system consisting of spread footings and continuous strip footings. However, clayey sands were encountered at the existing ground surface in borings TB-1 and HA-3. This suggests that clayey sands may be encountered at the footing bearing depths during construction of shallow foundations. Clayey sands typically contain relatively high moisture contents that make them difficult to sufficiently compact to provide adequate support for shallow foundations. Any clayey sands encountered during foundation excavation that cannot meet specified density criteria will need to be undercut to a depth of 1 foot below the bottom of the foundation and backfilled in accordance with the recommendations for fill placement presented below.

Footings which bear on densified existing soils or new structural fill should be capable of an allowable bearing pressure of 2,500 to 3,000 pounds per square foot. Site preparation (including clearing, stripping, and proofrolling) will be required to provide adequate support for shallow foundations and pavements.

The results of this exploration also indicate that fine sands, slightly silty sands, and slightly clayey sands classified as Strata 1, 2, and 3 soils are available for use as select fill across the site to depths of 5 feet or more. Clayey sands classified as Stratum 4 soils are generally not suitable for use as structural fill. However, they may be used as fill in landscape areas. Soils excavated from beneath the groundwater table will require drying prior to placement as structural fill.

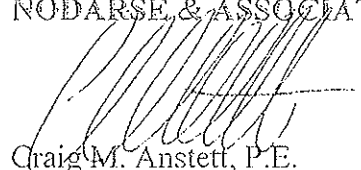
All fill placed to raise site grades in proposed structure and pavement areas should be inorganic, non-plastic, granular material classified as SP, SP-SM, or SP-SC soils. The fill should be placed in level lifts not to exceed 12 inches loose thickness. The fill should be compacted to a minimum of 95 percent of the soil's modified Proctor maximum dry density as determined by ASTM Specification D-1557. In-place density tests should be performed on each lift by an experienced engineering technician working under the direction of a registered Geotechnical Engineer to verify that the recommended degree of compaction has been achieved.

CLOSURE

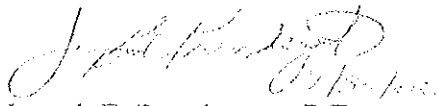
N&A appreciates the opportunity to be of service to you on this project. If you should have any questions concerning the contents of this report, or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,

NODARSE & ASSOCIATES, INC.



Craig M. Anstett, P.E.
Tampa Area Manager
Florida Registration No. 60850

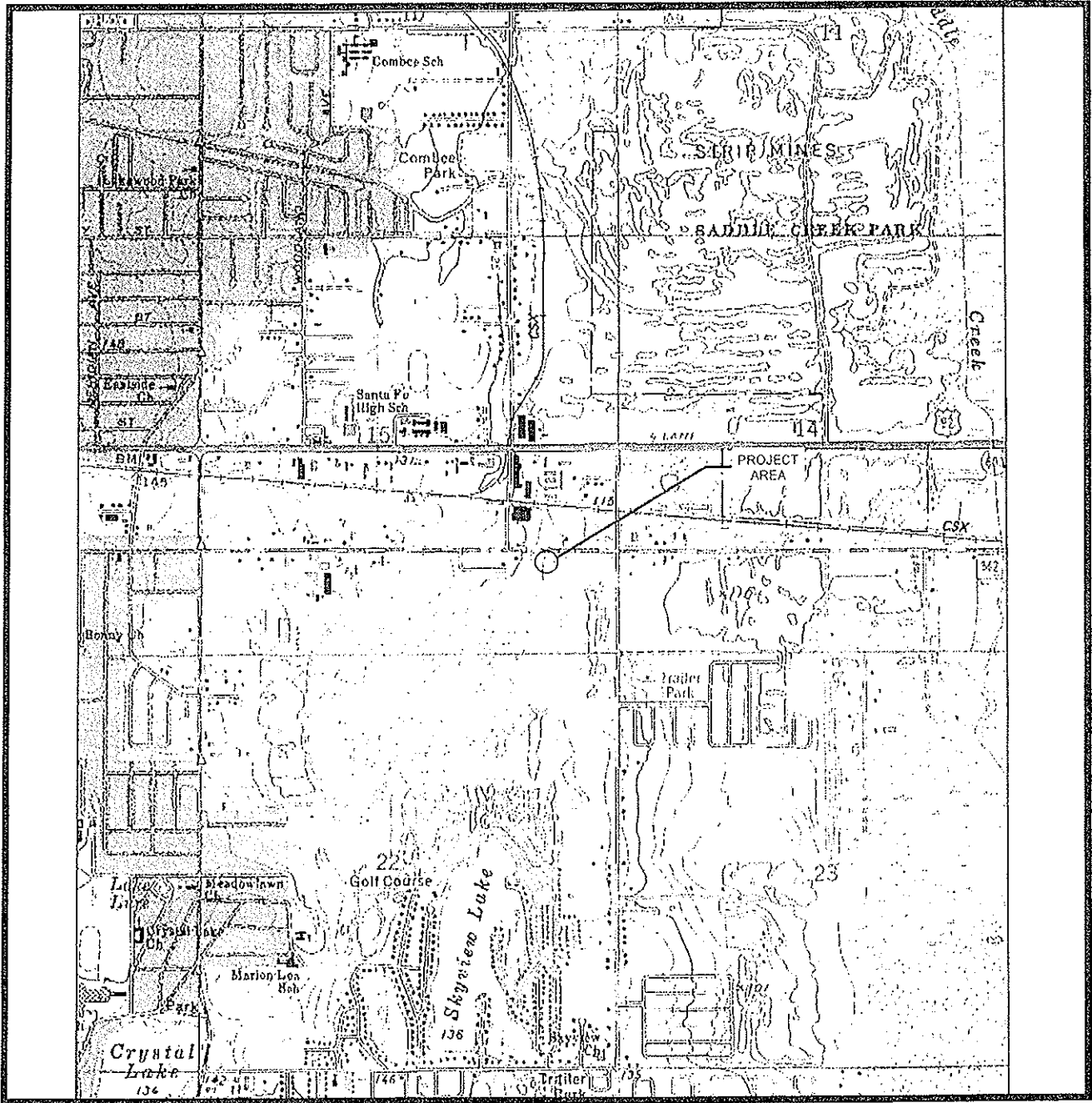


Joseph E. Prendergast, P.E.
Senior Geotechnical Engineer
Florida Registration No. 50774

Distribution: 3 - Addressee

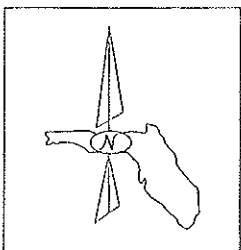
Appendix: USGS Quadrangle Map (Figure 1)
SCS Soil Survey Map (Figure 2)
Boring Location Plan (Figure 3)
Soil Boring Profiles (Figure 4)

APPENDIX



REFERENCE: U.S.G.S. "LAKELAND, FLORIDA" QUADRANGLE MAP
SECTION: 15
TOWNSHIP: 28 SOUTH
RANGE: 24 EAST

ISSUED: 1987
REVISED: NONE

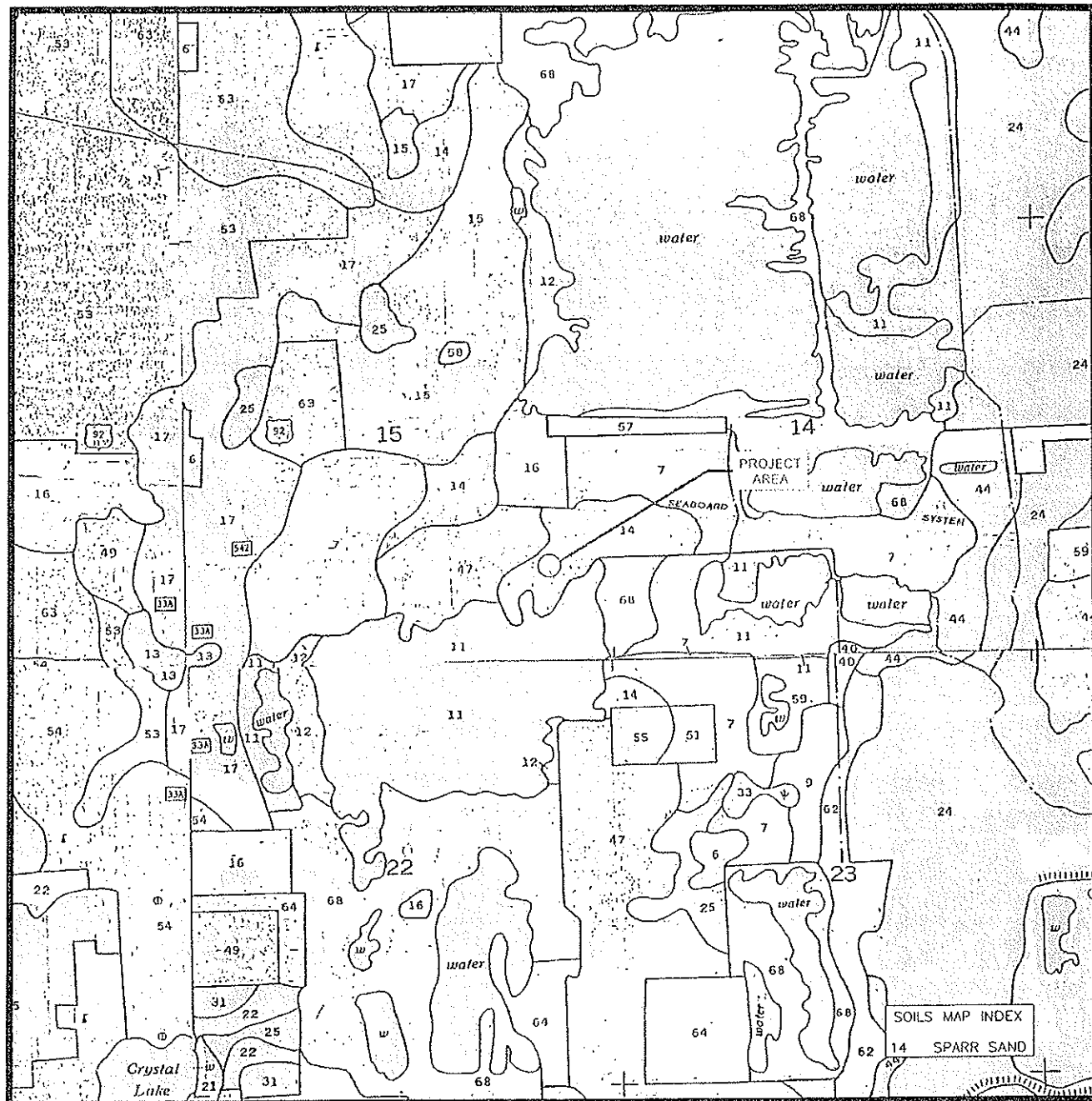


U.S.G.S. QUADRANGLE MAP
REYNOLDS ROAD SITE
REYNOLDS ROAD AND EAST MAIN STREET
POLK COUNTY, FLORIDA

DRAWN: TMB
CHKD: JEP
SCALE: 1"=2000'
DATE: 07-24-08

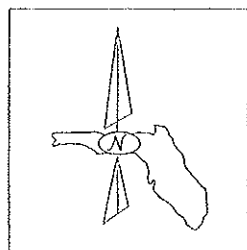
NODARSE
ASSOCIATES, INC.

PROJ. NO: 09--08--0005--102A
FIGURE: 1



REFERENCE: U.S.D.A. -- S.C.S. SOIL SURVEY FOR POLK COUNTY, FLORIDA
 SECTION: 15
 TOWNSHIP: 28 SOUTH
 RANGE: 24 EAST

ISSUED: 1990



U.S.D.A. -- SOILS MAP
 REYNOLDS ROAD SITE
 REYNOLDS ROAD AND EAST MAIN STREET
 POLK COUNTY, FLORIDA

DRAWN: TMB

CHKD: JEP

SCALE: 1"=2000'

DATE: 07-24-08

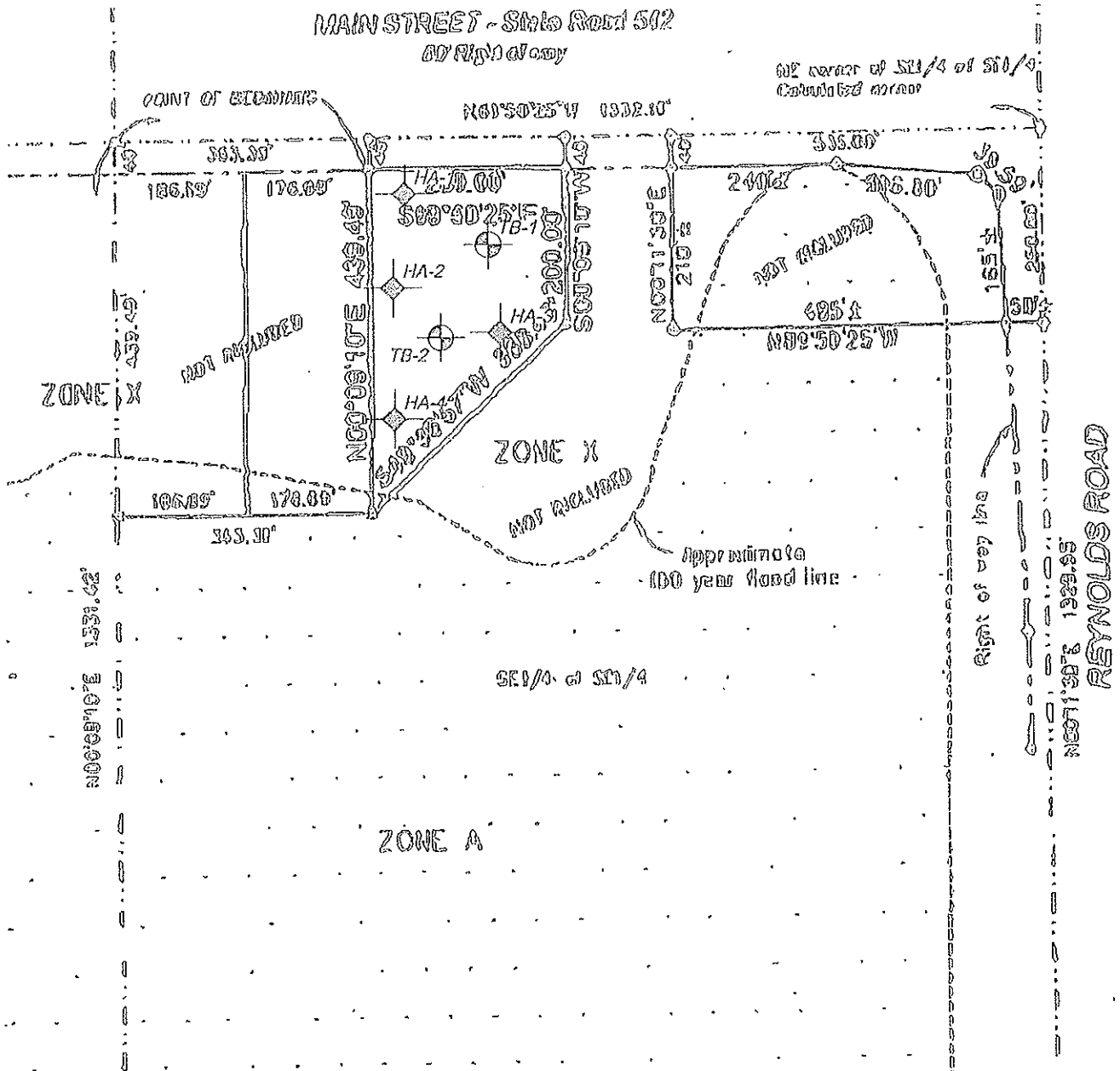


NODARSE
 & ASSOCIATES, INC.



PROJ. NO:
 09-08-0005-102A

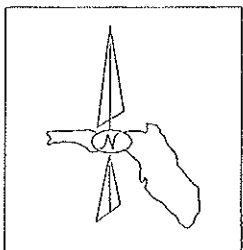
FIGURE: 2

Jul 24, 2008 10:06am R:\2008\09080005_PolkCoContinuingContract\102_ReynoldsRoadSite\102-FIG-3.dwg



LEGEND

-  APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING
-  APPROXIMATE LOCATION OF HAND AUGER BORING



BORING LOCATION PLAN REYNOLDS ROAD SITE REYNOLDS ROAD AND EAST MAIN STREET POLK COUNTY, FLORIDA

DRAWN: TMB

CHKD: JEP

SCALE: N.T.S.

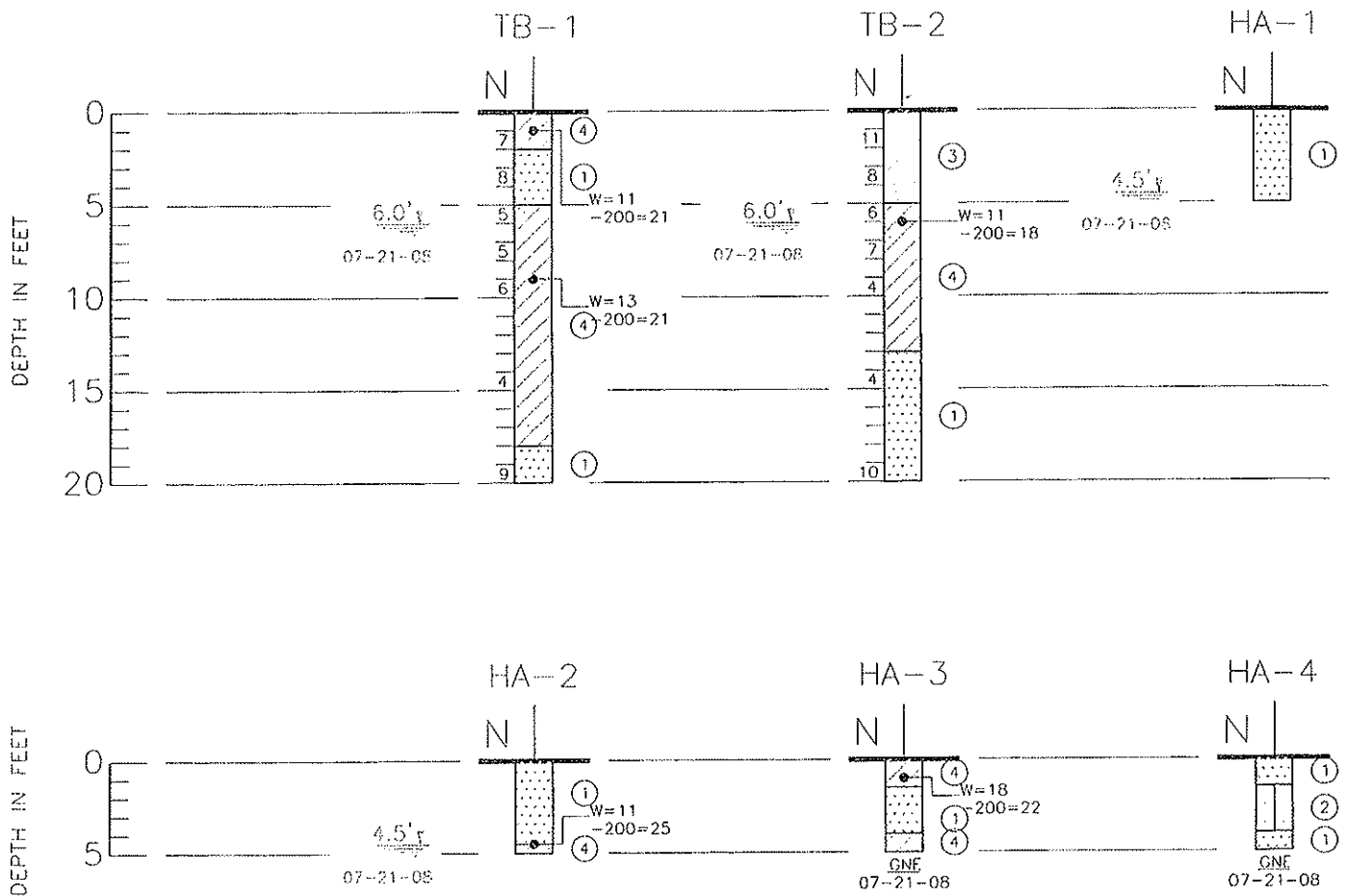
DATE: 07-24-08



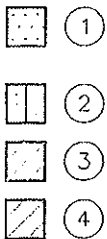
NODARSE
ASSOCIATES, INC.

PROJ. NO: 09-08-0005-102A

FIGURE: 3



LEGEND



- ① LIGHT BROWN TO BROWN FINE SAND WITH TRACES OF SILT (SP)
- ② DARK BROWN SLIGHTLY SILTY SAND (SP-SM)
- ③ LIGHT BROWN TO LIGHT GRAY SLIGHTLY CLAYEY SAND (SP-SC)
- ④ LIGHT BROWN TO GRAY CLAYEY SAND (SC)

(SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL AS DETERMINED BY VISUAL EXAMINATION

6.0' DEPTH TO GROUNDWATER LEVEL IN FEET WITH DATE OF READING

GNE GROUNDWATER NOT ENCOUNTERED IN THE DEPTH OF BORING

N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT

W NATURAL MOISTURE CONTENT (%)

-200 FINES PASSING No. 200 SIEVE (%)

SOIL BORING PROFILES
REYNOLDS ROAD SITE
REYNOLDS ROAD AND EAST MAIN STREET
POLK COUNTY, FLORIDA

DRAWN: TMB

CHKD: JEP

SCALE: NOTED

DATE: 07-24-08



PROJ. NO: 09-08-0005-102A

FIGURE: 4

SECTION 01100

SUMMARY

PART 1 GENERAL

1.01 WORK BY OWNER

- A. Owner will supply the following for installation by Contractor:
 - 1. Area Map
 - 2. Ice Maker; Located in EMS storage room.
 - 3. Sleep room beds.
 - 4. Sleep room chair.

1.02 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Provide access to and from site as required by law and by Owner.
- C. Maintain Fire Access Lanes.

1.03 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Owner and Architect.

1.04 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS

- A. Unless otherwise noted, all provisions of the sections listed below apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.
- B. Section 01230 - Alternatives.
- C. Section 01300 - Administrative Requirements.
- D. Section 01400 - Quality Requirements.
- E. Section 01500 - Temporary Facilities and Controls.
- F. Section 01600 - Product Requirements.
- G. Section 01700 - Execution Requirements.
- H. Section 01780 - Closeout Submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01300

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Full-time, "on-site", Project Superintendent.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Schedule of Values.
- F. Coordination drawings.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals.
- I. Submittal procedures.

1.02 RELATED SECTIONS

- A. Document 00700 - General Conditions: Dates for applications for payment.
- B. Section 01700 - Execution Requirements: Additional coordination requirements.
- C. Section 01780 - Closeout Submittals: Project record documents.

1.03 PROJECT COORDINATION

- A. Project Coordinator: Construction Manager or General Contractor.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for all access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Manufacturer's instructions and field reports.
 - 6. Applications for payment and change order requests.
 - 7. Progress schedules.
 - 8. Coordination drawings.
 - 9. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRE-BID MEETING

- A. Owner will schedule a meeting after advertisement.
- B. Attendance Required:
 - 1. Bidding Subcontractors .
- C. Agenda:
 - 1. Introductions
 - 2. Record of those Subcontractors in Attendance.
 - 3. Scope of Work.
 - 4. Alternates
 - 5. Phasing of Work.
 - 6. Staging Areas Allowed.
 - 7. Areas to remain uninterrupted for owner's continuing use.
 - 8. Review of Bid Documents.
 - 9. Review of Addenda.
 - 10. Review of new questions by the bidders.

3.02 PRECONSTRUCTION MEETING

- A. Owner will schedule a meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor, including assigned Superintendent..
 - 4. Major Subcontractors..
- C. Agenda:
 - 1. Submission of executed bonds and insurance certificates.
 - 2. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
 - 3. Designation of personnel representing the parties to Contract, the owner's representative, and Architect.
 - 4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 5. Scheduling.
- D. Construction Manager will record minutes and distribute copies within 5 days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.03 FULL TIME, ON SITE, PROJECT SUPERINTENDANT

- A. The project superintendant shall be on the premises full time and during all aspects of construction operations and coordination.
- B. The project superintendant assigned to this project may not have or share other project assignments or duties for the duration of this project.

3.04 PROGRESS MEETINGS

- A. Construction manager will schedule and administer meetings throughout progress of the Work at monthly intervals.
- B. Construction manager will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review progress of Work.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems which impede planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.
 - 13. Review Request for Payment Applications.
 - 14. Review Change Orders and Proposal Requests.
 - 15. Review Request for Information Schedule.
 - 16. Review maintenance of record documents.
 - 17. Other business relating to Work.
- E. Construction manager will record minutes and distribute copies within 5 days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.05 CONSTRUCTION PROGRESS SCHEDULE

- A. Construction manager will within 10 days after date of the Agreement, submit preliminary schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 10 days after joint review, submit complete schedule.
- D. Submit updated schedule with each Application for Payment.

3.06 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. All items requiring a color selection shall be submitted as a group. Colors will not be selected individually.
- C. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- D. Samples will be reviewed only for aesthetic, color, or finish selection.
- E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01780 - CLOSEOUT SUBMITTALS.

3.07 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.

2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

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

3.08 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit the following:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
- B. Copy of approved Submittals for Review.
- C. Copy of approved Submittals for Information.
- D. See Section 01780 - Closeout Submittals for additional requirements.

3.09 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies which the Contractor requires, plus three copies which will be retained by the Architect.
 2. Larger Sheets, Not Larger Than 24"x36": Submit the number of opaque reproductions which Contractor requires, plus three copies which will be retained by Architect.
- B. Documents for Information: Submit three copies.
- C. Documents for Project Closeout: Make one reproduction of approved submittal documents.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 1. Retained samples will not be returned to Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

- A. Transmit each submittal with AIA Form G810.
- B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- C. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- D. Deliver submittals to Architect at business address.
- E. Schedule submittals to expedite the Project, and coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor and Architect review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any

inability to comply with requirements.

- K. Submittals requiring a color selection will be reviewed as a group. Individual color selections will not be made. If submitted individually they will be reviewed for content only. Color selections will follow receipt of all color submittals, completion of and approval by owner of a color schedule.
- L. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance submittals.
- B. Mock-ups.
- C. Control of installation.
- D. Tolerances.
- E. Testing services.
- F. Manufacturers' field services.

1.02 RELATED SECTIONS

- A. Document 00700 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01300 - Administrative Requirements: Submittal procedures.
- C. Section 01600 - Product Requirements: Requirements for material and product quality.

1.03 SUBMITTALS

- A. Design Data: Submit for Architect's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Conformance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 - 2. Test reports are submitted for Architect's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the

Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

- E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- F. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES

- A. Owner will employ and pay for services of an independent testing agency to perform specified testing.
 - 1. Contractor shall pay for retesting.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
 - 6. Perform additional tests and inspections required by Architect.
 - 7. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional

- samples, tests, and inspections required by Contractor beyond specified requirements.
- 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price.

3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
 - 1. Observer subject to approval of Architect.
 - 2. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telephone and facsimile service.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Security requirements.
- F. Vehicular access and parking.
- G. Waste removal facilities and services.
- H. Project identification sign.
- I. Field offices.

1.02 TEMPORARY UTILITIES

- A. Cost: By The Contractor.
- B. Provide power service required from utility source.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
- D. Provide main service disconnect and over-current protection at convenient location and meter.
- E. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
- F. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- G. New permanent facilities may not be used.

1.03 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain incandescent lighting for construction operations to achieve a minimum lighting level of 2 watt/sq. ft.
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.
- D. Permanent building lighting may be utilized during construction.

1.04 TEMPORARY COOLING and HEATING

- A. Cost of Energy: By the Contractor.
- B. Provide cooling and heating as needed to maintain specified conditions for construction operations.
- C. Existing facilities shall not be used.

- D. Prior to operation of permanent equipment for temporary cooling and heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.05 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By the Contractor.
- B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

1.06 TELEPHONE SERVICE

- A. Provide, maintain and pay for facsimile service and a dedicated telephone line, or cellular and internet service to field office at time of project mobilization.

1.07 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.08 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide protection for plants designated to remain. Replace damaged plants.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.09 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular gates with locks.

1.10 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- D. Tracked vehicles not allowed on paved areas.
- E. Prevent parking on or adjacent to access roads or in non-designated areas.
- F. Confine construction traffic to designated haul routes.
- G. Maintain traffic and parking areas in a sound condition free of excavated material, constructions equipment, products, and mud.
- H. Repair existing facilities damaged by use, to original condition.
- I. Do not allow vehicle parking on existing pavement.

1.11 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

- B. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.12 PROJECT IDENTIFICATION

- A. Provide project identification sign of design and construction.
 - 1. Submit Shop Drawing (to scale) of signage graphics.
 - 2. Sign shall identify the Project Name.
 - 3. Sign shall identify the following, with addresses, license numbers and color logos for each:
 - a. Owner
 - b. Architect
 - c. Architect's Consultants
 - d. General Contractor
- B. Erect on site at location established by Architect.
- C. Provide construction site entrance signs.
- D. No other signs are allowed without Owner permission except those required by law.
- E. Sign Materials
 - 1. Structure and Framing: New, wood, structurally adequate.

1.13 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture.
- B. Provide space for Project meetings, with table and chairs to accommodate 6-8 persons.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01600

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations and procedures.
- E. Procedures for Owner-supplied products.
- F. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

- A. Part A - Bidding Requirements: Product options and substitution procedures prior to bid date.
- B. Part B - Conditions of Contract: Product options and substitution procedures subsequent to bid date.
- C. Section 01400 - Quality Requirements: Product quality monitoring.

1.03 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Do not use products having any of the following characteristics:
 - 1. Made using or containing CFC's or HCFC's.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

- A. Part A - Bidding Requirements - Supplementary: Specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in that section.
- B. Part B - Conditions of Contract: Specify product options and substitution procedures subsequent to bid date. Comply with requirements stated therein.
- C. Substitutions must be approved in writing by the architect prior to the bid due date.
- D. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- F. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- H. Substitution Submittal Procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. The Architect will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

- A. See Section 01100 - Summary for identification of Owner-supplied products.
- B. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.

2. Arrange and pay for product delivery to site.
 3. On delivery, inspect products jointly with Contractor.
 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 5. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 3. Handle, store, install and finish products.
 4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- H. Prevent contact with material that may cause corrosion, discoloration, or staining.
- I. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- J. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01700

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, except payment procedures.

1.02 RELATED SECTIONS

- A. Section 01300 - Administrative Requirements: Submittals procedures.
- B. Section 01400 - Quality Requirements: Testing and inspection procedures.
- C. Section 01510 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.
- D. Section 01780 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.
- E. Individual Product Specification Sections:
 - 1. Advance notification to other sections of openings required in work of those sections.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration which affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
 - 6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Alternatives to cutting and patching.
 - f. Effect on work of Owner or separate Contractor.
 - g. Written permission of affected separate Contractor.

h. Date and time work will be executed.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State of Florida and acceptable to Polk County. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.05 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.06 COORDINATION

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01600.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

3.03 PREINSTALLATION MEETINGS

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

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.

- D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- G. Utilize recognized engineering survey practices.
- H. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

- A. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
- B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids

with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.

- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- I. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.
- J. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.07 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.09 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

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

3.11 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 15990 and 01400.

3.12 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
 - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
- I. See Sections attached for Final Cleaning Requirements for each trade.
- J. Clean all exterior paving with water pressure. Hose may be acceptable.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.

1. Provide copies to Architect and Owner.
- B. Notify Architect when work is considered ready for Substantial Completion.
- C. Contractor to prepare typed copies of listing of all uncompleted items at time of requesting substantial completion review.
- D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
- E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- F. Notify Architect when work is considered finally complete.
- G. Complete items of work determined by Architect's final inspection.

3.14 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections during the warranty period.
- B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01780

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General Project Data.
- B. Release of Liens.
- C. As Built Drawings.
- D. Project Record Documents.
- E. Operation and Maintenance Data.
- F. Warranties and bonds.

1.02 RELATED SECTIONS

- A. Conditions of the Contract: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01300 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01700 - Execution Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. All closeout submittals listed herein must be submitted, approved and accepted by the architect and owner, PRIOR to final payment.
- B. Project Record Documents:
- C. Operation and Maintenance Data:
 - 1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 2. Submit 2 copies of completed documents 10 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
- D. General Project Data:
 - 1. General contractor and all subcontractor contact information; address, phone, fax, e-mail.
 - 2. List of subcontractors, area of involvement, contract information.
 - 3. Finish schedule complete with color selections as installed.
- E. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
 - 2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Identify all marks on record documents with date, addenda number, etc.
- D. Store record documents separate from documents used for construction.
- E. Record information concurrent with construction progress.
- F. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- G. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Record drawings (as-builts) shall be on reproducible type sheets.
 - 2. Measured depths of foundations in relation to finish first floor datum.
 - 3. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 5. Field changes of dimension and detail.
 - 6. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
 - 1. Include: fax numbers, two (2) contact names and titles, and their scope of work.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.

- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Additional information as specified in individual product specification sections.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- C. Include color coded wiring diagrams as installed.
- D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Include test and balancing reports.
- O. Additional Requirements: As specified in individual product specification sections.

3.05 OPERATION AND MAINTENANCE MANUALS

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.
- C. Binders: Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

- E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- I. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Photocopies of warranties and bonds.

3.06 RELEASE OF LIENS

- A. Final and unconditional waiver of lien shall be provided from contractor and each subcontractor, supplier and vendor for the project:
 - 1. Typewritten, and on the general contractor's letterhead.
 - 2. Original (signed in ink) delivered to the owner.
 - 3. The general contractor holds harmless the owner from all claims and property liens resulting from the project.
 - 4. The waiver shall state that all payments have been made and received.
 - 5. Attach all signed release of liens.

3.07 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 x 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of

Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02311

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Chain-Link Fences: Industrial.
 - 2. Gates: swing.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates, gate operators, and hardware.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

- A. General: Height indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Metallic-coated wire with a diameter of 0.192 inch.
 - a. Mesh Size: 2 inches (50 mm).
 - b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. (610 g/sq. m) with zinc coating applied before weaving.
 - c. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.
2. Selvage: Knuckled at both selvages Twisted top and knuckled bottom.

2.2 INDUSTRIAL FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:
 1. Group: IA, round steel pipe, Schedule 40.
 2. Strength Requirement: Heavy industrial according to ASTM F 1043.
 3. Post Diameter and Thickness: According to ASTM F 1043 [**ASTM F 1083**].
 - a. Swing Gate Post: According to ASTM F 900.
 4. Coating for Steel Framing:
 - a. Metallic Coating:
 - 1) Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.

2.3 INDUSTRIAL GATES

SWING GATES

- A. General: Comply with ASTM F 900 for single swing gate types.
 1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.
- B. Frames and Bracing: Fabricate members from round, galvanized steel tubing with outside dimension and weight according to ASTM F 900 and the following:
 1. Gate Fabric Height: 2 inches (50 mm) less than adjacent fence height.
 2. Leaf Width: As indicated on Drawings.
 3. Frame Members:
 - a. Tubular Steel: 1.90 inches (48 mm) round.
- C. Frame Corner Construction:
 1. Welded.

- D. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet (1.52 m) wide. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

ROLLING GATE

- E. 24' wide x 6' high, ½ HP, 208-230V single phase electric motor operated, sliding V-track gate to include the following operational functions and be UL 325 compliant:
1. Free exit loop and loop detector
 2. Radio receiver with 10 remotes
 3. Manual push button for open & close
 4. Timer to close
 5. 7 day timer – Minimum 3 Events per day. Equal to Securitron, Assa Abloy, DT-7 Digital Timer – 7 Day with the following specifications:
 - a. The digital timer shall be produced by an ISO 9001 certified manufacturer.
 - b. The timer shall be of the daily or weekly digital timer type.
 - c. The timer shall operate on 12 or 24 volt AC or DC.
 - d. The timer shall have 12 program instructions, including block instructions for Monday-Sunday, Monday-Saturday, and Monday-Friday.
 - e. The timer shall be capable of controlling loads of up to 10 amps at 12 or 24 volt AC or DC via a DP/DT relay.
 - f. The timer shall be equipped with a “First Man In” feature to increase security.
 - g. The timer’s program memory is maintained in a power failure by an onboard alkaline battery.
 6. Photo cells front and back
 7. Tie all to emergency generator circuit.

2.4 FITTINGS

- A. General: Comply with ASTM F 626.
- B. Rail Fittings: Provide the following:
1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
- C. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
 - a. Hot-Dip Galvanized Steel: 0.148-inch- (3.76-mm-) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- D. Finish:
1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. (366 g /sq. m) zinc.

2.5 CAST-IN-PLACE CONCRETE

- A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94/C 94M. Measure, batch, and mix Project-site-mixed concrete according to ASTM C 94/C 94M.
 - 1. Concrete Mixes: Normal-weight concrete air entrained with not less than 3000-psi (20.7- MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

3.4 CHAIN-LINK FENCE INSTALLATION

- A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches (50 mm) above grade; shape and smooth to shed water.
- C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment as indicated on Drawings.
- D. Line Posts: Space line posts uniformly at 10 feet (3 m) o.c.

- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at midheight of fabric 6 feet (1.83 m) or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- F. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- G. Bottom Rails: Install, spanning between posts.
- H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch (25.4 mm) between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches (380 mm) o.c.
- J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 - 1. Maximum Spacing: Tie fabric to line posts at 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) o.c.
- K. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.5 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

END OF SECTION

SECTION 02923

TURF AND GRASSES

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. Sodding.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- C. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- D. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- E. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

- A. Turfgrass Sod: Approved Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Bahia.

2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 PLANTING SOILS

- A. Planting Soil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in wet, or muddy conditions.

3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
1. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Apply superphosphate fertilizer directly to subgrade before loosening.
 2. Spread planting soil to a depth of 4 inches (100 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is muddy, or excessively wet.
 - a. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
1. Loosen surface soil to a depth of at least 6 inches (150 mm). Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches (100 mm) of soil. Till soil to a homogeneous mixture of fine texture.
 2. Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, trash, and other extraneous matter.
 3. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

- E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.5 TURF RENOVATION

- A. Renovate existing turf.
- B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 - 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).
- I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.
- J. Apply sod as required for new turf.

- K. Water newly planted areas and keep moist until new turf is established.

3.6 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow bermudagrass to a height of 1/2 to 1 inch (13 to 25 mm).
 - 2. Mow bahiagrass to a height of 2 to 3 inches (50 to 75 mm).
- D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.

3.7 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.8 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

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- C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. See Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Shop Drawings: For steel reinforcement
- D. Material certificates.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5. Sections 1 through 5 and Section 7, "Lightweight Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, graded, 3/4-inch nominal maximum coarse-aggregate size.
 - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.

3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

2.4 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.6 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.50
 3. Slump Limit: 5 inches plus or minus 1 inch.
 4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
 5. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd..

2.7 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

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

3.3 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
1. Apply scratch finish to surfaces to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial

application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
 - 1. Testing Services: Tests shall be performed according to ACI 301.

END OF SECTION

SECTION 03365

POLISHED CONCRETE FLOOR SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Polished concrete floor system with penetrating dye.

1.02 RELATED SECTIONS

- A. Section 03300 – Cast-in-Place Concrete.

1.03 REFERENCES

- A. ASTM C 1028 – Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
- B. ASTM D 523 – Standard Test Method for Specular Gloss.
- C. ASTM E 1155 – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.

1.04 SYSTEM DESCRIPTION

- A. Installation of polished concrete floor system for new interior concrete floors by dry grinding and polishing with various size grit metal-bonded and resin-bonded diamonds and application of concrete densifier.
- B. Performance Requirements: Improve performance of floor by installation of polished concrete floor system as measured by the following criteria:
 - 1. Floor Surface Profile, ASTM E 1155:
 - a. Floor Flatness Number (F_F): SOV > 50, MOV > 35.
 - b. Floor Levelness Number (F_L): SOV > 50, MOV > 35.

1.05 SUBMITTALS

- A. Comply with Section 01330 – Submittal Procedures.
- B. Product Data: Submit installer's product data, including surface preparation and installation instructions.
- C. Samples: Submit installer's samples of penetrating dye colors.
- D. Installer's Certification: Submit IPCI certification of installer and installer's employees.
- E. Installer's Project References: Submit installer's list of successfully completed polished concrete floor system projects, including project name and location, name of architect, and type and quantity of polished concrete floor system installed.
- F. Maintenance Manual: Submit installer's maintenance manual, including maintenance and cleaning instructions for polished concrete floor system.

1.06 QUALITY ASSURANCE

- A. Installer's Qualifications:
 - 1. Certified IPCI installer.
 - 2. Employ IPCI Certified Craftsmen for installation of polished concrete floor system.
 - 3. Employ a minimum of one IPCI Certified Craftsmen for installation of polished concrete floor system involving color or decorative work if color or decorative work is included in the this section.
- B. Pre-installation Meeting:
 - 1. Convene pre-installation meeting before start of installation of polished concrete floor system.
 - 2. Require attendance of parties directly affecting work of this section, including Owner, Contractor, Architect, and installer.
 - 3. Review examination, surface preparation, installation, field quality control, protection, and coordination with other work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage:
 - 1. Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
 - 2. Keep materials from freezing.
- C. Handling: Protect materials during handling and application to prevent contamination or damage.

PART 2 PRODUCTS

2.01 INSTALLER

- A. Consult IPCI to find certified IPCI installers.
 - 1. International Polished Concrete Institute, PO Box 1174, Norris, Tennessee 37828. Toll Free (866) 421-9550. Phone (865) 494-7881. Fax (865) 494-0872. Website 1Twww.ipcionline.org. E-mail info@ipcionline.org.

2.02 EQUIPMENT TO BE USED FOR INSTALLATION

- A. Floor Grinder:
 - 1. Model: Concrete Polishing Solutions "G-320". (or equivalent)
 - 2. Type: Multi-orbital, planetary-action, opposing-rotational, diamond-headed floor grinder.
 - 3. Weight: 850 pounds.
 - 4. Grinding Pressure: 675 pounds.
 - 5. Grinding Width: 32 inches.
 - 6. Motor: 15 HP.
 - 7. Maximum RPM: 1,750.
 - 8. Head: 3-head system contours to floor surface.
- B. Vacuum System: Concrete Polishing Solutions (or equivalent) model as determined by installer to perform required dust extraction during grinding and polishing of concrete floor.
- C. Diamond Tooling for Coating Removal, Initial Grinding, and Preparing Floor for Polishing:

1. Concrete Polishing Solutions "MFL" 80-grit metal-bonded diamonds. (or equivalent)
 2. Concrete Polishing Solutions "MFL" 150-grit metal-bonded diamonds. (or equivalent)
- D. Diamond Tooling for Polishing Concrete:
1. Concrete Polishing Solutions "GST" 100-grit resin-bonded diamonds. (or equivalent)
 2. Concrete Polishing Solutions "GST" 200-grit resin-bonded diamonds. (or equivalent)
 3. Concrete Polishing Solutions "GST" 400-grit resin-bonded diamonds. (or equivalent)

2.03 MATERIALS

- A. Concrete Densifier:
1. Concrete Polishing Solutions "Armor Densifier MFL". (or equivalent)
 - a. Permanent sealing, densifying, and hardening compound for concrete.
 - b. Odorless.
 - c. VOC: 0.
- B. Concrete Sealer:
1. Concrete Polishing Solutions "Armor Stain Shield MFL". (or equivalent)
- C. Penetrating Dye: Concrete Polishing Solutions "Color Perfect" colorants. (or equivalent)
1. Type: Solvent based.
 2. Color: As selected by Architect. (similar products/colorants may be substituted)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine floor to receive polished concrete floor system.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin surface preparation or installation until unacceptable conditions are corrected.
- D. Verify the Following for New Concrete Floors:
1. Floor Finish:
 - a. Slabs and flatwork shall be placed and finished monolithically.
 - b. Strike off and laser screed slabs to true, plane surfaces at required elevations.
 - c. Thoroughly compact concrete with vibrators, floats, and tampers to force coarse aggregate below the surface.
 - d. Power trowel with no hand finishing.
 - e. Pan float.
 - f. Steel finish.
 - g. Surface should not be burned due to excessive troweling.
 - h. Imprints are not acceptable (i.e. boots, foreign objects dropped into concrete).
 2. Floor and Joints:
 - a. Free of debris and excessive dirt, dust, clay, and mud.
 - b. Dry.
 3. Floor Surface Profile:
 - a. Floor Flatness Number (F_F): 50 (preferred) 45 (minimum).

- b. Floor Levelness Number (F_L): 35 (preferred) 30 (minimum).
4. Concrete Compressive Strength: 3,500 psi to 5,000 psi.
5. Lightweight Concrete: Not allowed if aggregate exposure is required.
6. Concrete Curing: Minimum 8 days **water cured or dissipating curing compound** applied.
7. Concrete Adjacent to Floor Penetrations: Troweled flat and level with surrounding concrete.
8. Concrete Adjacent to Drains, clean-outs, etc: Finish level to the top of the structure.

3.02 SURFACE PREPARATION

- A. Protection: Protect surrounding areas and adjacent surfaces from the following:
 1. Minimal accumulation of dust from grinding and polishing.
 2. Contact with overspray of concrete densifier.
 3. Contact with overspray of concrete sealer.
- B. Surface Preparation: Prepare surfaces in accordance with installer's instructions.
- C. Clean Surfaces: Remove dirt, dust, debris, oil, grease, curing agents, bond breakers, paint, coatings, and other surface contaminants which could adversely affect installation of polished concrete floor system.

3.03 INSTALLATION

- A. Install polished concrete floor system in accordance with installer's instructions at locations indicated on the Drawings.
- B. Aggregate Exposure:
 1. Cream Aggregate: Minimal to no course aggregate exposure.
- C. Polished Concrete Floor System: IPCI Sheen Level 2 – Low Sheen.
 1. Preparation Step:
 - a. Remove existing floor coatings and level floor by grinding with 80-grit metal-bonded diamonds.
 2. Apply concrete densifier to deeply saturate floor.
 3. Remove residue of concrete densifier dried on floor surface by grinding with 150-grit metal-bonded diamonds.
 4. Floor Closure Polishing:
 - a. Remove 150-grit metal-bonded diamond scratches by grinding with 100-grit resin-bonded diamonds.
 - b. Remove 150-grit metal-bonded and 100-grit resin-bonded diamond scratches by grinding with 200-grit resin-bonded diamonds.
 - c. Complete floor polish by grinding with 400-grit resin-bonded diamonds.
 5. Apply concrete sealer.
- D. Penetrating Dye:
 1. Mix dye in accordance with installer's instructions.
 2. Apply penetrating dye as last step before applying concrete sealer in accordance with installer's instructions.

3.04 FIELD QUALITY CONTROL

- A. Inspect completed polished concrete floor system with Owner, Contractor, Architect, and Installer.

- B. Review procedures with Architect to correct unacceptable areas of completed polished concrete floor system.
- C. Testing: Test the following from completed polished concrete floor system:
 - 1. Floor Surface Profiles, ASTM E 1155:
 - a. Floor Flatness Number (F_F).
 - b. Floor Levelness Number (F_L).
- D. Test Results:
 - 1. Report test results in writing to Owner, Contractor, and Architect within 24 hours after tests.
 - 2. Compare test results from tests performed before and after installation of polished concrete floor system.

3.05 PROTECTION

- A. Protect completed polished concrete floor system from damage until Substantial Completion.
 - 1. Do not allow vehicle and pedestrian traffic on unprotected floor.
 - 2. Do not allow construction materials, equipment, and tools on unprotected floor.
- B. Immediately remove mortar splatter, spilled liquids, oil, grease, paint, coatings, and other surface contaminants which could adversely affect completed polished concrete floor system.
- C. Repair damaged areas of completed polished concrete floor system to satisfaction of Architect.

END OF SECTION

SECTION 04000

MASONRY, GENERAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conform to Division 1, General Requirements, which applies to all sections of this Division 4. Provisions of this Section 04000 also apply to all sections of this Division 4. The articles contained in this section may modify, delete or add to the provisions of the conditions of the Contract.

1.02 SAMPLES

- A. Submit three (3) full size samples of all clay units to ARCHITECT for review. Show complete range of colors and sizes specified. Secure ARCHITECT'S acceptance prior to first shipment.

1.03 FIELD MEASUREMENTS, COORDINATION AND SAFE PRACTICES

- A. Furnish location information for all required dowels to be set in foundations and verify location before concrete is placed.
- B. Verify all field dimensions to insure close fit with work of other trades.
- C. Coordinate and install this division's work in proper sequence and cooperation with all other trades, to insure that total work is completed within contract time schedule.
- D. Check bearing surfaces for proper grade and lines before starting work. Report discrepancies to ARCHITECT for decision, prior to commencement of work.
- E. Obtain exact sizes and locations of openings required by other trades; and properly build around same.
- F. Build-in all required items as furnished by others.
- G. Safety during construction is the sole responsibility of the CONTRACTOR. Published standards (OSHA, etc.) and industry standards of good practices are to be followed.

1.04 RELATED WORK IN OTHER DIVISIONS/SECTIONS

Division 3:	Concrete
Division 5:	Metals
Division 7:	Thermal and Moisture Protection
Division 8:	Doors and Windows
Division 9:	Finishes
Division 15:	Mechanical
Division 16:	Electrical

1.05 DELIVERY AND PROTECTION OF MATERIALS

- A. General: Handle all masonry units by competent careful workmen and by such methods as will prevent damage by chipping, mutilation or soiling. Avoid dumping from wheelbarrows and trucks and other rough handling.
- B. Veneer Masonry Units: Ship palletized. Break no pallets until each pallet is required for installation on building. Stack pallets neatly, on leveled supports. Covering of unbroken pallets is not required.
- C. Concrete Masonry Products: Stack on planking with cells placed horizontally, keeping units freely

ventilated. Deliver all units in dry condition. Keep dry during storage on job, and until 24 hours after they are laid in wall. If covered storage space is unavailable in building, cover with layer of polyethylene waterproof covering. Covering with loose sheets of felt or sisalkraft paper is not permitted.

- D. Mortar Products: Deliver materials dry. Keep dry until mixed.

1.06 WEATHER CONDITIONS

- A. During rainy weather, do all work only under cover. Do no masonry work whenever temperature drops below 40 deg. F. Protect all newly laid masonry from below 40 deg. F. temperatures for 36 hours after installation by enclosing and heating.

1.07 WORK NOT IN PROGRESS

- A. When work is stopped, whenever possible, bring continuous portions of walls to same level before stopping work. Keep tops of walls covered with non-staining non-absorbing waterproof covering. Extend covering down over two courses, on both sides. When work is resumed, clean top surfaces of loose mortar. Wet brick units thoroughly before resuming work.

PART 2 - PRODUCTS

2.01 Mortar Materials: (Use products of domestic mfg.)

Portland Cement: Conform to ASTM C150, Type I or II
Masonry Cement: Conform to ASTM C91, Type II
Hydrated Lime: Conform to ASTM C-207, Type N
Sand: Conform to ASTM C-144, and pass a #16 mesh sieve
Water: Clean and fit to drink.
Waterproofing Admixtures: Use one of the following
(1) Anti-Hydro Company "Anti-Hydro"
(2) A. C. Horn "Hydratite Plus"
(3) Toch Brothers "RIW Toxment"
(4) Hydrocide "Powder"

2.02 STEEL REINFORCEMENT

- A. Joint Reinforcing shall be (Dur-O-Wal or equivalent products of AA Wire Products Co., Hohmann & Barnard, Inc., National Wire.): 9 gauge deformed welded wire. Truss type, or ladder type is approved for all single wythe masonry walls, width set individually for each wall width. Provide "Ladur-Eye" type for all cavity wall locations. Provide #6 rectangular (D/A 515) pintle tie sections sized for selected veneer wythes and cavity width. Use hot-dipped galvanized members ASTM A153 -Class B2, 1.50 ounce zinc coating.
1. Provide prefabricated corners and tee sections (or approved field made method) to provide continuity at corners and intersections as required by part 3.22 herein. Corners size 30" x 30", tee 30" x 30".
- B. Reinforcing Bars: conform to ASTM A-615 "Deformed Billet Steel Bars for Concrete Reinforcement" grade 60. Bars to be free from flaws, cracks or other defects of rolling, true size and shape, and free of loose scales of rust. Bars to be free from heavy dirt, paint, grease, oil, or other destroyers of bond.
- C. Steel stirrups shall conform to ASTM A82, FY-60 KSI minimum. Stirrups shall be 5/16" diameter smooth rod and be formed to manufacturer's standard profile.

2.03 COMPOSITE STEEL LINTELS

- A. Galvanized steel lintels, sized 2" less than wall thickness, as manufactured by Powers Steel & Wire

Products, Inc., or Composite Steel Lintels may be used as detailed on structural drawings. Paint all site cut ends with zinc rich primer well before installation. Size per manufacturer's load tables, 16 gauge minimum thickness of material.

2.04 PRECAST LINTELS

- A. Refer to Section 04200 / Concrete Masonry.
- B. Reinforcing and grouting shall be as detailed on structural drawings.

2.05 MASONRY WALL CLEANER

- A. "Sure-Kleen 600", or as approved.

2.06 MORTAR PREPARATION

- A. Mortar Types and Proportions: see other sections of this division.
- B. **Measuring and Mixing:** Measure ingredients accurately using measuring devices approved by the ARCHITECT.
Mix by machine, and as approved by ARCHITECT. Hand mixing is permitted only in small quantities. For grouting and pointing, mix as stiff as can be worked into joints.
 - 1. Place one half of sand and water in mixer, then add cement, lime, remainder of sand and water. Mechanically mix ingredients in batch mixer for period of not less than three (3) minutes. Discard all mortar which remains unused 1 ½ hours after mixing time.
Do not use materials containing lime where there is a possibility of "bleeding" thru finishes applied over masonry.

2.07 DOUBLE WYTHE MASONRY CAVITY WALL FLASHING

- A. Description: Self-sealing, self-healing, fully adhering, composite flexible flashing consisting of 32 mil thick pliable and highly adhesive rubberized asphalt compound bonded completely and integrally to 8 mil thick, high-density, four plies of cross-laminated polyethylene film to produce an overall 40 mil thickness. Provide in roll form, sized to project requirements, "Perma-A-Barrier Wall Flashing", by W. R. Grace & Co., or as approved. Products shall be certified compatible with Section 07100/Wall Dampproofing/Waterproofing.
- B. Accessories
 - 1. Surface Conditioner / Primer: "Perm-A-Barrier Surface Conditioner", latex based, water dispersible liquid.
 - 2. Termination Mastic: "Bituthene Mastic", a rubberized asphalt based composition.
- C. Metal Flashing: 22 Gauge Type 304 stainless steel or .040 mill finish aluminum as shown on drawings, formed to profiles indicated.

2.08 DOUBLE WYTHE MASONRY CAVITY WALL INSULATION

- A. Refer to Section 07210/Thermal and Sound Insulation.

2.09 WEEPS

- A. Refer to Section 04012/Brick Masonry.

2.10 WALL CONTROL/EXPANSION JOINTS

- A. Refer to Section 07920/Sealants, Caulking and Seals.
- B. Provided are general guidelines for the locations and sizes of joints. However, jointing design is dependent on the materials selected, the makeup of the materials, environmental conditions, and the architectural/structural design and detailing. Factors to be considered are:
 - 1. Temperature effects.
 - 2. Shrinkage effects.
 - 3. Creep.
 - 4. Stresses caused by the architectural/structural design.
 - 5. Moisture effects.
- C. All expansion and contraction joints shall be shown and detailed by the Engineer or Architect.
 - 1. Expansion joints in masonry shall be provided at the following locations:
 - a. Below shelf angles or structural frames supporting masonry walls or panels.
 - b. Above masonry walls or panels abutting structural frames.
 - c. At major changes in wall heights.
 - d. Near wall intersections.
 - e. At regular intervals, not to exceed 25'-0."
 - 2. Contraction joints in masonry shall be provided at the following locations:
 - a. At major changes in wall heights.
 - b. At changes in wall thickness.
 - c. Above joints in foundations.
 - d. At columns and pilasters.
 - e. At one or both sides of wall openings.
 - f. Near wall intersections.
- D. Critical construction joints shall be planned for and shown on the drawings, with guidelines for other construction joints specified in Section 03300/Cast-In-Place Concrete, to be prepared as a part of the contract documents. Other proposed construction joints as specified in Section 03300 shall be submitted by the Contractor to the Engineer for review and approval during construction.

PART 3 - EXECUTION

3.01 LAYOUT

- A. Lay all masonry by workmen who are skilled in their trade. Lay in bonding required in other sections of this division with joints plumb and courses straight. Course interior wall out to match exterior wall coursing. Shim base course or cut if necessary to course out. Mark location of all reinforcing dowels (filled cells) plainly on floor or lowest course of block.
- B. Sample Panels: Construct an approximate 20 square foot sample panel. Show all details of veneer and concrete block workmanship; including cavity construction, masonry reinforcing, insulation, dampproofing, joint treatment, window sill and jamb to include all flashing. Secure ARCHITECT'S approval prior to start of building veneer work. ARCHITECT will use accepted panel to measure quality of project work. Keep panel intact until ARCHITECT approves disposal.

3.02 EXECUTION

- A. Lay-up: do not move masonry units after they are mortared in place. If adjustments are required, remove units and replace using fresh mortar. Lay all masonry units with 3/8" maximum width full head and bed joints in both horizontal and vertical joints.
- B. Pattern Bond: lay CMU wall units in common-running bond with vertical joints in each course centered on units in courses above and below unless otherwise indicated. Bond and interlock each

course at corners and at intersections. Do not interlock bearing walls with non bearing partitions. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.

- C. Maintain vertical continuity of cell cavities. Cells which are to be reinforced and grouted to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
- D. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place cavity cups in mortar joints under bond beam courses over cells of non-reinforced masonry.
- E. Joint Reinforcing: set in all concrete masonry walls, 6" thick and thicker, including ties to all brick veneer. Lay at 16" o.c. vertical (unless noted otherwise on drawings) in all exterior and interior walls in continuous horizontal courses in full mortar beds, and to include joint reinforcing at 1st and 2nd masonry courses above and below wall openings, building in reinforcing as work progresses. Reinforcing shall extend a minimum of 24" into wall from edge of each opening. Splice lap lengths shall be a minimum of 6" and shall contain at least one cross wire from each piece of lapped reinforcing. Lay in all horizontally-bonded masonry walls. Comply with Florida Building Code, using the specified prefabricated tees and corners for all intersections of wall and all inside and outside corners.
 - 1. Veneer Ties at Masonry Backup: set in Ladur-O-Eye truss at 24" o.c. horizontally. Set loose eye ties at same spacing.
- F. Setting Iron Work: set all loose lintels, anchors, sleeves, inserts, etc. in exact locations; true and level in full beds of mortar set as a part of masonry work, not before. Lay brick to bear against all anchors to prevent slippage. Completely cover all anchors and other similar work with mortar or grout.
 - 1. Construction Tolerances: the finished brick veneer plane is not to vary more than 1/4" from plumb. Shelf angle shall be sized so that the outer edge of the outstanding leg is 3/4" from exterior wall surface unless detailed otherwise. Shims, if required, are to be square horseshoe shape galvanized and placed at each embedded insert or anchor bolt and tack welded in place. Maximum shim allowable is 1". Note that lengths of bolts supporting shelf angles could vary because of differing tolerances of various components of building structure.
- G. Setting Cavity/Veneer Flashings: refer to details on drawings and provide thru wall flashing continuous at all ledger angles, loose lintels, under all window sills and other locations as shown on drawings or required to expel moisture to outside. Coordinate installation of flashings with other trades to insure that top edge of flashing is fully sealed in a permanent manner. All laps and repairs shall be 6" lap and sealed with sealant.
- H. Setting Grounds: build all grounds and nailing blocks required for fastening of all trim and other finish, into wall. Install nailing blocks for fastening of grounds, wood trim, and other materials required to be fastened to walls.
- I. Metal Frames: set frames true, plumb, level and out of wind. Use a minimum of 4 wire type anchors on each side of the door frame. Anchors should be installed at hinge areas on frame. Anchors should be designed so that wire will be completely encased in the concrete grout and/or mortar joints. Fasten door frame to floor with two pins on each side. Build masonry tight to frames. Solidly fill all voids and grout all jambs and heads **including intermediate mullions**. Build frames into masonry as work progresses. Pieces shorter than 4 inches are not permitted. Rake all mortar joints at frames $\pm 1/2"$ deep, for caulked joint specified in other section(s).
- J. Cutting and Chases: avoid cutting of masonry units. Where it cannot be avoided, cut with a masonry

saw in neat and regular manner, with all edges true, and no exposed faces chipped/spalled. Cut masonry carefully and accurately to fit and conceal all heating, plumbing and electrical pipes, conduits, and ductwork; and fit neatly around all openings, equipment, and access doors and panels. Coordinate all masonry work with respective trades. Leave chases in walls as required by other trades.

- K. Setting of Lintels: install precast and/or composite steel lintels over all openings. Set lintels in place with joints pointed to match adjacent work. Build in lintels, reinforce and fill with structural concrete grout as work progresses. Refer to Section 04200 / Concrete Masonry.
- L. Placing Grout: Refer to Section 04200 / Concrete Masonry.
- M. MASONRY WALL CONTROL/EXPANSION JOINTS
 - 1. Locate expansion joints to accommodate anticipated expansion at abrupt changes in the structure, where butting up to existing structures, and at least one corner of windows, doors, and other rectangular openings.
 - 2. The spacing of joints shall be contingent on the material's capacity to sustain expansion without damage to the concrete or masonry (usually based on the amount of reinforcing).
 - 3. Structural reinforcing shall be discontinuous across the joint. Terminate reinforcing a minimum of two (2) inches from the faces of the joint.
 - 4. Smooth reinforcing dowels, properly detailed, shall be provided to prevent movement out of the plane of the vertical surface and to provide for shear transfer (as required).
 - 5. The minimum expansion joint width shall be 1/4".
 - 6. Expansion joints shall be sealed. Refer to Section 07920/Caulking.
 - 7. Where applicable, waterstops shall be provided for watertightness.

3.03 POINTING AND CLEANING

- A. After jointing and pointing is completed and joints set up hard, clean all exposed concrete masonry surfaces with clear water and stiff fiber brushes. Leave concrete and brick masonry clean, free of mortar daubs and with tight mortar joints throughout. Do cleaning strictly according to published recommendations of Southern Brick and Tile Manufacturers Association for cleaning brick work. Acid is not permitted.
 - 1. Keep cavity clean of mortar droppings as wall is built up. Use appropriate means to avoid mortar "bridges" to back-up material and obstruction of flow to weep holes.

3.04 MASONRY WALL HEIGHTS

- A. Refer to wall sections, elevations and reflected ceiling plan and other drawings to verify all wall heights. Adequately brace and support walls in place.

3.05 JOINTS AT OVERHEAD STRUCTURE

- A. At all joints where non-bearing masonry walls are laid to underside or edge of any structural slab, joist, or beam allow 1/2" wide open unmortared joint for possible deflection. Firmly pack joint with oakum or glass fiber batt insulation material. At fire rated locations use an approved U.L. rated material.

END OF SECTION

SECTION 04820

REINFORCED UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete Block.
- B. Mortar and Grout.
- C. Reinforcement and Anchorage.
- D. Flashings.
- E. Lintels.
- F. Accessories.

1.02 RELATED SECTIONS

- A. Section 06176 - Metal Plate Connected Wood Trusses: Anchorage inserts.

1.03 REFERENCES

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2002.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2002.
- C. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units; 2002.
- D. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2000.
- E. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 2002.
- F. ASTM C 1019 - Standard Test Method for Sampling and Testing Grout; 2002.
- G. IMIABC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.
- H. IMIABC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar and grout.
- C. Shop Drawings: Indicate bar sizes, spacings, reinforcement quantities, bending and cutting schedules, reinforcement supporting and spacing devices, and accessories.

1.05 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1.06 MOCK-UP

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high, which includes mortar and accessories.

- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather Requirements: Comply with recommendations of IMIAWC (CW).
- B. Hot Weather Requirements: Comply with IMIAWC (HW).

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
 - 2. Load-Bearing Units: ASTM C 90, Grade N.
 - a. Hollow block.
 - b. Type II: Non moisture-controlled; normal weight.
 - c. Exposed faces: Manufacturer's standard color.
 - d. Pattern: Vertical single score.
 - e. Pattern: split face.
 - f. Compression strength based on net area shall be 1900 psi minimum for fm' = 1500 psi.

2.02 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C 91 Type M.
- B. Portland Cement: ASTM C 150, Type I.
 - 1. Grout Aggregate: ASTM C 404.
- C. Water: Clean and potable.
- D. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 40 (280).
 - 1. Deformed billet-steel bars.
 - 2. Unfinished.
- B. Single Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
 - 1. Provide factory fabricated sections at all corners and wall intersections.

2.04 FLASHINGS

- A. Copper/Kraft Paper Flashings: 3 oz/sq ft sheet copper bonded to fiber reinforced asphalt treated Kraft paper. Provide AFCO Copper Fabric manufactured by AFCO Products, Inc..

2.05 ACCESSORIES

- A. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.06 LINTELS

- A. Precast Concrete Lintels: U type, 8 x 8 inch size with 8" score, similar to Rinker SF 2 Rib, as required psi strength at 28 days.
 - 1. Provide precast type or prestressed type as required by the span and to meet building code.
 - 2. 8 inch bearing.
 - 3. Provide saw cut opening 5" x 4" at bearing for placement of vertical reinforcement and grout.

2.07 MORTAR MIXES

- A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.
 - 1. Engineered masonry: Type M.

2.08 MORTAR MIXING

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C 270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. If water is lost by evaporation, re-temper only within two hours of mixing.
- D. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

2.09 GROUT MIXES

- A. Lintels and filled cells: 3,000 psi strength at 28 days; 9 inches maximum slump; provide premixed type in accordance with ASTM C 94/C 94M.
 - 1. Maximum size of aggregate: 3/8 inch.
 - 2. Minimum cement content: 650 lb.
 - 3. Maximum water/cement ratio: .58.

2.10 PRECONSTRUCTION TESTING

- A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01400.
- B. Grout Mixes: Test grout batches in accordance with ASTM C 1019 procedures.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Clean reinforcement of loose rust.
- C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- D. For areas where high-lift grouting will be employed, provide cleanout openings as follows:

1. Hollow Masonry: Not less than 8 inches high at the bottom of each cell to be grouted, formed by cutting out face shell of masonry unit.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 1. Bond: Running.
 2. Coursing: One unit and one mortar joint to equal 8 inches.
 3. Mortar Joints: tooled concave.

3.04 PLACING AND BONDING

- A. Lay hollow masonry units with face shell bedding on head and bed joints.
- B. Interlock intersections and external corners.
- C. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- D. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.05 REINFORCEMENT AND ANCHORAGE

- A. Reinforcement Bars: Secure at locations indicated and to avoid displacement during grouting. Minimum spacing between bars or to masonry surfaces shall be one bar diameter.
 1. Splices shall be Class B tension lap splices.
 2. Reinforcement designated as continuous shall lap 30 bar diameters.
 3. Hooks to be ACI standard.
 4. Reinforcing at corners shall be continuous.
 5. Splice continuous top bars at center between supports and splice continuous bottom bars at supports. Top bars shall be hooked where not continuous.
- B. Joint Reinforcement: Install horizontal joint reinforcement 16 inches on center.
 1. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 24 inches each side of opening.
 2. Lap joint reinforcement ends minimum 6 inches.
- C. Reinforced Hollow Unit Masonry: Keep vertical cores to be grouted clear of mortar, including bed area of first course.
 1. Bond Beams: At bond beams or other locations for horizontally reinforced masonry, provide special masonry units or saw to accommodate reinforcement.

3.06 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 6 inches to form watertight pan at non-masonry construction.
- B. Extend laminated flashings to within 1/16 inch of exterior face of masonry.
- C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.07 GROUTING

- A. Perform grouting by means of high-lift technique, except in locations that mandate use of low-lift grouting technique.
- B. Low-Lift Grouting:
 - 1. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
 - 2. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
- C. High-Lift Grouting:
 - 1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
 - 2. Clean out masonry cells and other cavities to be grouted. Remove debris, and inspect before sealing cleanout openings.
 - 3. Place grout for spanning elements in single, continuous pour.

3.08 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

3.09 TOLERANCES

3.10 CUTTING AND FITTING

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

3.11 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.
- B. Clean soiled surfaces with cleaning solution.

END OF SECTION

SECTION 05000

METALS, GENERAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Conform to Division 1, General Requirements, which applies to all sections of this Division 5. Provisions of this Section 05000 also apply to all sections of this Division 5. The articles contained in this section may modify, delete or add to the provisions of the conditions of the Contract.

1.02 FIELD MEASUREMENTS AND COORDINATION

- A. Verify all field dimensions to insure close fit with work of other trades.
- B. Coordinate and install this division's work in proper sequence and cooperation with all other trades, to insure that total work is completed within contract time schedule.
- C. Verify extent of all items to be furnished including incidental items related to or necessary for a complete installation, their required shapes and sizes, and sequence with which these items are to be furnished and installed. Furnish to jobsite sorted, tagged, and grouped according to use.

1.03 RELATED WORK IN OTHER DIVISIONS/SECTIONS

Division 2:	Site Work
Division 3:	Concrete
Division 4:	Masonry
Division 10:	Specialties
Division 15:	Mechanical
Division 16:	Electrical

1.04 APPLICABLE TECHNICAL CODES AND STANDARDS

- A. Conform to applicable provisions of latest editions of following reference codes, except as specifically modified hereinafter.
 - 1. American Institute of Steel Construction "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings".
 - 2. American Institute of Steel Construction "Specification For The Design of Cold Formed Steel Structural Members".
 - 3. American Welding Society - D1.1 "Structural Welding Code".
 - 4. American Welding Society - D1.3 "Structural Welding Code - Sheet Steel".
 - 5. Steel Structures Painting Council.
 - 6. Metal Roof Deck Technical Institute Specification and Load Tables for Three-Span Ribbed Deck, latest edition.
 - 7. Steel Deck Institute, "Design Manual For Floor Decks and Roof Decks".
 - 8. Furnish affidavit to ARCHITECT certifying materials delivered to jobsite meet requirements specified. Certification does not relieve CONTRACTOR of responsibility of complying with all requirements herein.

1.05 SPECIAL MATERIAL DELIVERY AND HANDLING INSTRUCTIONS

- A. Protect all materials from weather, prior to and during fabrication, and before erection. Do not store materials directly on ground at any time. Insure that all abrasions in shop painted work are immediately painted with identical prime paint to insure no rusting of steel work.

- 1.06** Submit shop drawings in accordance with Section 01330/Shop Drawings Requirements of this specification.

PART 2 - PRODUCTS

2.01 STEEL ITEMS

- A. Structural Steel Beams, Plates, Channels, Angles and Bars: conform to ASTM A992, Structural Steel", latest edition.
- B. Steel For Galvanized Metal Deck Units - ASTM A446, Grade A.
- C. Galvanizing - ASTM A525, G60.
- D. Round, Square and Rectangular Steel Tubing: conform to ASTM A-500, "Hot-Formed Welded and Seamless Carbon Steel Structural Tubing", latest edition.
- E. Sheet Steel: prime grade cold-rolled steel, properly annealed, process leveled, with smooth clean surfaces.
- F. Bolts, Nuts and Washers: conform to ASTM A-307, "Low-Carbon Steel Externally and Internally Threaded Standard Fasteners", latest edition. ASTM A-325, "High Strength Bolts for Structural Steel Joints", including suitable nuts and plain hardened washers.
- G. Anchors, Expansion Bolts and Shields and Strap: furnish and install all necessary items required for this contract which in judgement of ARCHITECT are required, whether or not each item is specifically described in contract documents. Expansion bolts and shields must be galvanized or of non-ferrous metals, sized suitable for work to be anchored, and used where built-in place anchors are not practicable. All bolts furnished with nuts and washers. Materials normally to be identical to material being fastened.
- H. Welding Electrodes: conform to ASTM A-233, Type E 70XX electrodes, or otherwise required for joint condition.
- I. Other Steel Items: conform to ASTM A-36, "Steel for Bridges and Buildings", latest edition.

2.02 PRIMER PAINT

- A. Zinc chromate, iron oxide, rust inhibitive metal primer, meeting SSPC P-15-68T, Type I and TT-P-63C.
- B. Electrolysis Prevention Between Dissimilar Metals: aluminum-pigmented asphalt paint produced by regionally recognized producer.
- C. Primer at spray-applied fire protection locations shall have been tested and reported by

Underwriters Laboratories to be in compatible compliance.

PART 3 - EXECUTION

3.01 Make and erect all work square, plumb, straight and true. Fit tightly, firm, and secure against designed stresses and weights of supported materials and building occupants.

3.02 Furnish all supplementary parts necessary to complete each item, even though such parts are not definitely shown or specified. Include all anchors, sockets, pipe sleeves, tabs, etc., for securing work.

3.03 FABRICATION

- A. Insure all material has all surfaces cleaned per the AISC Code requirements. Remove all dirt, rust, grease, mill scale, etc. Prior to layout or being worked in any way, carefully inspect all pieces for straightness and level; and straighten and level without impairment of strength, all pieces requiring same.
Neatly and accurately shear, clip, cut, drill, punch and/or weld all portions of work, whether or not normally exposed to view.
- B. Accurately fabricate all members to insure that all parts fit together on jobsite without jobsite cutting.
- C. Accurately punch and space all bolt holes. Size and align for firm connection and bearing.
- D. Conform all steel welding to applicable provisions of referenced code by certified welders.
- E. After fabrication is complete, clean all surfaces of rust, scale, dirt and grease.
 - 1. Shop fabrication errors shall not be corrected in the field without prior written approval of the ARCHITECT and OWNER.
 - 2. The ARCHITECT and OWNER reserves the right to have his representative inspect the fabrication or erection at any stage of completion.
 - 3. The ARCHITECT'S and OWNER'S inspectors in no way will relieve the CONTRACTOR of his responsibility in meeting the codes and specifications.

3.04 ERECTION

- A. Provide all temporary bracing required for proper alignment and stability of all steel members during erection.
- B. Temporary bracing and/or shoring shall remain as long as necessary for the safety and stability of the structure.

3.05 SHOP PAINTING

- A. Prior to painting, all steel is to be cleaned to a SSPC-SP3 surface. Deliver all structural steel to project fully coated with specified primer paint, except:
 - 1. Areas Not to Receive Paint:
 - a. Areas within 2 inches of joints which are to be welded.
 - b. All non-ferrous surfaces not subject to electrolytic action.

c. All items to be embedded in concrete.

- C. Electrolysis Prevention - Dissimilar Metals and Metals In Contact With Masonry: apply one (1) coat of aluminum pigmented asphalt paint on contact surfaces of metal in contact with dissimilar metals.

3.06 JOB SITE TOUCH-UP PAINTING

- A. Clean and properly prepare all exposed surfaces after welding and paint with approved primer all welded and burned surfaces.
- B. Clean and repaint all shop painted areas after work is erected which are still accessible and which have been abraded sufficient to expose metal.
- C. All cut, drilled, burned or welded galvanized and/or painted surfaces shall be primed with approved primer.

3.07 HANDLING AND MARKING

- A. Clearly and neatly mark all members for identification and erection sequence. Bundle members as CONTRACTOR requires for erection. Deliver to jobsite without damage to members. Repair or refabricate all damaged members.

3.08 WELDING

- A. Only certified welders are to be employed on project. Submit current certificates, not over 2 years old. Welders to be qualified in accordance with Section 5 of the AWS D1.1 code, latest edition.
1. It should be noted that thin gauge metals (roof trusses, decks and structural studs) are included in project. Special care is to be taken to insure proper welding techniques are exercised with these materials.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural roof framing.
- B. Wall sheathing.
- C. Roof decking.
- D. Ceiling construction panels.
- E. Preservative treatment of wood.
- F. Fire retardant treatment of wood.
- G. Telephone and electrical panel boards.
- H. Wood nailers and curbs for roofing and items installed on roof.
- I. Concealed wood blocking for support of toilet and bath accessories, wall cabinets, wood trim, and miscellaneous items.
- J. Miscellaneous wood nailers and furring strips.

1.02 REFERENCES

- A. AFPA T10 - Wood Frame Construction Manual; American Forest and Paper Association; 2001.
- B. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 1999.
- C. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2002.

1.03 QUALITY ASSURANCE

- A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 x 2 through 2 x 6):
 - 1. Species: Southern Pine.
 - 2. Grade: No. 2.
- E. Miscellaneous Blocking, Furring, and Nailers:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.02 CONSTRUCTION PANELS

- A. APA Rated Roof Sheathing: Exterior Exposure Class, and as follows:
 - 1. Structural II.
 - 2. Span Rating: 24/0.
 - 3. Thickness: 5/8 inch, nominal.
- B. APA Rated Wall Sheathing: Exterior Exposure Class, and as follows:
 - 1. Structural II.
 - 2. Span Rating: 24/0.
- C. Miscellaneous Panels:
 - 1. Concealed Plywood: PS 1, C-C Plugged, exterior grade.
 - 2. Exposed Plywood: PS 1, A-D, interior grade.
 - 3. Electrical Component Mounting: APA rated sheathing, fire retardant treated.

2.03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
 - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
 - 3. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.04 FACTORY WOOD TREATMENT

- A. Fire Retardant Treatment: AWPA Treatment C20, Interior Type A Low Temperature (low hygroscopic), chemical treatment pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 0 / 25.
- B. Pressure Treatment of Lumber Above Grade: AWPA Treatment C2 using waterborne preservative to 0.25 lb/cu ft retention.
 - 1. Kiln dry after treatment to maximum moisture content of 19 percent.
 - 2. Treat wood in contact with roofing, flashing, or waterproofing.
 - 3. Treat wood in contact with masonry or concrete.

PART 3 EXECUTION

3.01 FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.
- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

- G. Provide bridging at joists in excess of 8 feet span at mid-span. Fit solid blocking at ends of members.
- H. Frame openings with two or more studs at each jamb; support headers on cripple studs.
- I. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.02 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

- A. Provide all blocking to support all wall hung items, including but not limited to cabinetry, millwork, toilet partition and accessories.
- B. Coordinate installation of wood decking and prefabricated wood trusses.

3.03 INSTALLATION OF CONSTRUCTION PANELS

- A. Roof Sheathing: Secure panels perpendicular to framing members, with ends staggered and sheet ends over firm bearing.
 - 1. Use sheathing clips between roof framing members.
 - 2. Provide solid edge blocking between sheets.
 - 3. Nail panels to framing; staples are not permitted. Refer to drawings for nailing pattern.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
 - 1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items: Soffit

1.02 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Grounds and support framing.
- B. Section 09900 - Paints and Coatings: Painting and finishing of finish carpentry items.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft.

1.04 DELIVERY, STORAGE, AND PROTECTION

- A. Protect work from moisture damage.
- B. Stack on edge or lay flat on smooth level surface.
- C. Protect edges and corners from chipping.

PART 2 PRODUCTS

2.01 FASTENERS

- A. Fasteners: Of size and type to suit application; exposed, flush finish in concealed locations and concealed finish in exposed locations.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Set and secure materials and components in place, plumb and level.
- B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
- C. Install materials in accordance with manufacturer's instructions.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09900.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

END OF SECTION

SECTION 06410

CUSTOM CABINETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Special fabricated cabinet units.
- B. Countertops.
- C. Cabinet hardware.

1.02 REFERENCES

- A. AHA A135.4 - Basic Hardboard; American Hardboard Association; 1995.
- B. AWI (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.
- C. GSA CID A-A-1936 - Adhesive, Contact, Neoprene Rubber; Federal Specifications and Standards; 1996.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 1995.
- E. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.
- F. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 1999.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit two each, 2x2 inch in size, illustrating cabinet finish and counter top finish.
- E. Samples: Submit one sample of drawer pulls and hinges, illustrating hardware finish.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom quality.
- B. Perform cabinet construction in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom grade.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Protect units from moisture damage.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. During and after installation of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.

PART 2 PRODUCTS

2.01 WOOD MATERIALS

- A. NO PARTICLE BOARD.
- B. Softwood Lumber: NIST PS 20; Graded in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom; average moisture content of 11 percent; species and grade as follows:
 - 1. Cabinet Frame: Species pine, poplar, or fir, Grade II.
 - 2. Internal Construction: Species pine, poplar or fir, Grade II.

2.02 PANEL MATERIALS

- A. NO PARTICLE BOARD.
- B. Softwood Plywood: NIST PS 1; Graded in accordance with AWI Architectural Woodwork Quality Standards Illustrated, core materials of veneer; located as follows:
 - 1. Cabinet Construction: 3/4" thick panels.
 - 2. Door and Drawer Fronts: 3/4" thick.
 - 3. Drawer Sides: 1/2" thick.
 - 4. Drawer Backs: 1/2" thick.
 - 5. Shelving: 3/4" thick.
 - 6. Backsplash: 3/4" thick.
- C. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side (S1S); use for drawer bottoms, dust panels, and other components indicated on drawings.

2.03 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corp: www.formica.com.
 - 2. Nevamar, International Paper: www.nevamar.com.
 - 3. Wilsonart International, Inc: www.wilsonart.com.
 - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Laminate Colors, Locations:
 - 1. Provide the manufacturer's full range of colors for selection by the architect.
 - 2. A minimum of four laminated colors (exposed to view) per room may be selected.
- C. Plastic Laminate: NEMA LD 3, HGS (0.048 inch thickness); color(s) as indicated; finish as selected.
- D. Laminate Backing Sheet: 0.050 inch Backing Sheet grade, undecorated plastic laminate. Use thermo-fused melamine laminated, high pressure bonded under 320 psi and 300 degrees F.

2.04 SOLID SURFACING MATERIALS

- A. Basis of Design:
 - 1. Zodiac Quartz surfaces from DuPont.
 - 2. Substitutions: See Section 01600 – Product Requirements.
- B. Color: Selected by Architect from manufacturers full palette of 35 colors.
- C. Thickness: 3/4"
- D. Edge Treatment: Bullnose.
- E. Sink Treatment: Drop in.

- F. Splashes: Applied back and end splash.

2.05 ACCESSORIES

- A. Adhesive: GSA CID A-A-1936 contact adhesive and as recommended by laminate and solid surfacing manufacturers.
- B. Fasteners: Size and type to suit application.
- C. Concealed Joint Fasteners: Threaded steel.
- D. Grommets: Plastic material for cut-outs.
- E. Slide Out Keyboard Tray: Height adjustable when pulled out.

2.06 HARDWARE

- A. Shelf Standards and Rests: Run all standards 1 piece full height or shelving. Knap & Vogt #255 slotted standards with #256 shelf supports.
- B. Shelf Brackets: Formed steel brackets, formed for attachment with lugs; chrome finish.
- C. Drawer and Door Pulls: EPCO 3 1/2" aluminum wire pull, brushed finish. Colors to be selected; or as approved.
- D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.
- E. Drawer Slides: Pr. Knap & Vogt Series #1429 full extension rated 100 lbs.
- F. Hinges, self-closing concealed casework hinges: Blum 71.6500/71.6600 170 degree opening, self closing flush overlay 91A6500 with mounting plate 195H7100 .

2.07 FABRICATION

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- C. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- D. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- E. Solid surfacing counters and splashes shall be 1 piece.
- F. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings, and grommets. Verify locations of cutouts from on-site dimensions. Seal cut edges.
- G. Provide blocking and space for under-counter mounted keyboard trays as located on the drawings.
- H. Provide locks for all doors and drawers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

- C. Verify field conditions and measurements to insure proper fit prior to fabrication of cabinetwork.

3.02 INSTALLATION

- A. Set and secure casework in place; rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
- D. Use color matched silicone sealant with solid surfacing materials.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinet to floor using appropriate angles and anchorages.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.
- B. Protect all finish surfaces from damage.

END OF SECTION

SECTION 07115

BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Bituminous dampproofing on inside face of CMU construction which receives furred out finish, typical.

1.02 REFERENCES

- A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 1994 (reapproved 2000).
- B. NRCA ML104 - The NRCA Roofing and Waterproofing; National Roofing Contractors Association; Fifth Edition.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 COLD ASPHALTIC MATERIALS

- A. Bitumen: Emulsified asphalt, ASTM - 95 with fiber reinforcement other than asbestos (Type II) Class 1 and ASTM D 1187, Type 1.
 - 1. Product: Sonoshield Hydrocide 700B Mastic manufactured by Sonneborn, Inc..
- B. Asphalt Primer: ASTM D 41, compatible with substrate.
- C. Sealing Mastic: Asphalt roof cement, ASTM D 2822, Type II.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
- C. Verify items which penetrate surfaces to receive dampproofing are securely installed.

3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's

instructions.

- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.03 APPLICATION

- A. Prime surfaces in accordance with manufacturer's instructions.
- B. Seal items projecting through dampproofing surface with mastic. Seal watertight.
- C. Apply with roller except apply with brush at corners penetrations.

END OF SECTION

SECTION 07212

BOARD AND BATT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at exterior wall behind drywall wall finish.
- B. Batt insulation in exterior ceiling construction.
- C. Sound batt insulation

1.02 RELATED SECTIONS

- A. Section 07115 - Bituminous Dampproofing.

1.03 REFERENCES

- A. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation; 2000.
- B. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2001.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

PART 2 PRODUCTS

2.01 BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation: ASTM C 578, Type IV; Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:
 - 1. Board Size: 48 x 96 inch.
 - 2. Board Thickness: 3/4 inches.
 - 3. Board Edges: Square.
 - 4. R Value 3.8.
 - 5. Compressive Resistance: 25 psi.
 - 6. Manufacturers:
 - a. Dow Chemical Co: www.dow.com.
 - 7. Substitutions: See Section 01600 - Product Requirements.

2.02 BATT INSULATION MATERIALS

- A. Batt Insulation: ASTM C 665, Type III, Class B; preformed glass fiber batt; conforming to the following; thickness/R value as shown below unless otherwise indicated on the drawings:
 - 1. Above Ceiling Location:
 - a. Thermal Resistance: R of 30.
 - b. Batt width: 16" or 24" to conform to framing spacing.
 - c. Facing: Unfaced with stapling flange.
 - d. Surface Burning Characteristics: Flame spread/Smoke developed of 75/150 in accordance with ASTM E 84.
 - e. Manufacturer: [Owens-Corning, or equal].
 - f. Substitutions: See Section 01600 - Product Requirements.

2.03 SOUND ATTENUATION INSULATION

- A. Fiberglass Batts:
 - 1. Thickness: [3.5] inch.
 - 2. Batt width: 16" or 24" to conform to framing spacing.
 - 3. Facing: Unfaced with stapling flange.
 - 4. Manufacturer: [Owens-Corning, or equal].
 - 5. Substitutions: See Section 01600 - Product Requirements.

2.04 ACCESSORIES

- A. Tape: Polyethylene self-adhering type, mesh reinforced, 2 inch wide.
- B. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Apply adhesive to back of boards:
 - 1. Four continuous beads per board length.
- B. Install boards vertically on walls.
 - 1. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Extend boards over expansion joints, unbonded to wall on one side of joint.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and ceiling spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Staple or nail facing flanges in place at maximum 6 inches on center.

3.04 PROTECTION OF FINISHED WORK

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

END OF SECTION

SECTION 07311

ASPHALT SHINGLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for valley protection.
- C. Associated metal flashings and accessories.

1.02 REFERENCES

- A. ASTM D 3462 - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules; 2003.
- B. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2000.
- C. NRCA MS104 - The NRCA Steep Roofing Manual; National Roofing Contractors Association; 2001, Fifth Edition.
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1993, Fifth Edition.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating material characteristics and performance criteria.
- C. Shop Drawings: For metal flashings, indicate specially configured metal flashings.
- D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color selection.
- E. Manufacturer's Instructions: Indicate installation criteria and procedures.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with the recommendations of NRCA Steep Roofing Manual.

1.05 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Provide 1 bundle of extra shingles of each color specified.

PART 2 PRODUCTS

2.01 SHINGLES

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D 3462; Class A fire resistance.
 - 1. Weight: 300 lb/100 sq ft.
 - 2. Warranty: 50 year.
 - 3. Algae resistant.
 - 4. Color: Selected from manufacturers standard range.

2.02 SHEET MATERIALS

- A. Underlayment: Asphalt-saturated organic felt underlayment, complying with ASTM D 4869,

minimum 8 lb/100 sq ft (Type I).

- B. Flexible Flashing: Rubberized asphalt sheet bonded to sheet polyethylene, 40 mil total thickness, with strippable treated release paper.

2.03 ACCESSORIES

- A. Nails: Standard round wire shingle type, of hot-dipped zinc coated steel, 12 gage, 0.105 inch shank diameter, 3/8 inch head diameter, of sufficient length to penetrate through roof sheathing or 3/4 inch into roof sheathing or decking.
- B. Plastic Cement: ASTM D 4586, asphalt roof cement.
- C. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents.

2.04 METAL FLASHINGS

- A. Metal Flashings: Provide sheet metal eave edge, gable edge, open valley flashing, and other flashing indicated.
 - 1. Form flashings to profiles indicated on Drawings.
 - 2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
 - 3. Hem exposed edges of flashings minimum 1/4 inch on underside.
- B. Sheet Metal: Prefinished aluminum, 0.032 inch thick; PVC coating, color as selected.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.
- B. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.
- C. Verify roof openings are correctly framed.
- D. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

- A. Seal roof deck joints wider than 1/16 inch with deck tape.
- B. Install eave edge flashings tight with fascia boards. Weather lap joints 2 inches and seal with plastic cement. Secure flange with nails spaced 8 inches on center.

3.03 INSTALLATION - UNDERLAYMENT

- A. At Roof Slopes Greater Than 4:12 : Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place. Weather lap minimum 4 inches over eave protection.
- B. Items projecting through or mounted on roof: Weather lap and seal watertight with plastic cement.

3.04 INSTALLATION - VALLEY PROTECTION

- A. Install one ply of flexible flashing, minimum 36 inches wide, centered over valleys.
- B. Install flexible flashing in accordance with manufacturer's instructions.
- C. Weather lap joints minimum 2 inches.
- D. At Exposed Valleys: Install one layer of sheet metal flashing, minimum 24 inches wide,

centered over open valley and crimped to guide water. Weather lap joints minimum 2 inch wide band of lap cement along each edge of first, press roll roofing into cement, and nail in place minimum 18 inches on center, 1 inch from edges.

3.05 INSTALLATION - METAL FLASHING AND ACCESSORIES

- A. Install flashings in accordance with NRCA requirements.
- B. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.
- C. Secure in place with nails at 8 inches on center. Conceal fastenings.
- D. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.06 INSTALLATION - SHINGLES

- A. Install shingles in accordance with manufacturer's instructions.
 - 1. Fasten individual shingles using 2 nails per shingle, or as required by code, whichever is greater.
 - 2. Fasten strip shingles using 4 nails per strip, or as required by code, whichever is greater.
- B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area. Provide double course of shingles at eaves.
- C. Project first course of shingles 3/4 inch beyond fascia boards.
- D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
- E. Cap hips with individual shingles, maintaining 5 inch weather exposure. Place to avoid exposed nails.
- F. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.
- G. Complete installation to provide weather tight service.

END OF SECTION

SECTION 07411

METAL ROOF PANELS (ALTERNATE NO. 2)

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. Standing-seam metal roof panels.

1.3 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight roofing system.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.
- C. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F 67 deg C, ambient, material surfaces.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
 - a. Flashing and trim.
- C. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.
 1. Include similar Samples of trim and accessories involving color selection.
- D. Qualification Data: For qualified Installer.
- E. Maintenance Data: For metal roof panels to include in maintenance manuals.
- F. Warranties: Samples of special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of metal roof panels from single source from single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Surface: Smooth, flat finish.
 - 2. Exposed Coil-Coated Finish:
 - a. 3-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).
- B. Panel Sealants:
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.

2.2 FIELD-INSTALLED THERMAL INSULATION

- A. Refer to Division 07 Section "Thermal Insulation." ()

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils (0.76 to 1.0 mm) thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
- B. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felts.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and snapping panels together.

1. Product: Subject to compliance with requirements, provide the following products or equivalent by one of the following:
 - a. Berridge Zee-Lock Standing Seam Roof System.
 - b. AEP-Span.
 - c. Metal Sales Manufacturing Corporation.
 - d. Petersen Aluminum Corporation.
2. Material: Zinc-coated (galvanized) steel sheet, 0.028-inch (0.71-mm) nominal thickness.
 - a. Exterior Finish: 3-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
3. Batten: Same material, finish, and color as roof panels.
4. Clips: Fixed.
 - a. Material: 0.064-inch- (1.63-mm-) nominal thickness, aluminum-zinc alloy-coated steel sheet.
5. Panel Coverage: 18 inches (457 mm).
6. Panel Height: 1.0 inch (25 mm).

2.6 ACCESSORIES

- A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
 2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum 0.018 inch (0.45 mm) thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

2.7 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

- C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. End Seams for Other Than Aluminum: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 5. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
- B. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
- C. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
 - 1. Valleys, from lowest point to highest point, for a distance on each side of 18 inches (460 mm). Overlap ends of sheets not less than 6 inches (150 mm).
 - 2. Hips and ridges for a distance on each side of 12 inches (300 mm).
 - 3. Around dormers, towers, and other penetrating elements for a distance from element of 18 inches (460 mm).
- B. Felt Underlayment: Apply at locations indicated below, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).
 - 1. Apply over entire roof surface.
- C. Apply slip sheet over underlayment before installing metal roof panels.
- D. Install flashings to cover underlayment to comply with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim."

3.3 METAL ROOF PANEL INSTALLATION, GENERAL

- A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
- B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.
 - 1. Point of Fixity: Fasten each panel along a single line of fixing located at center of panel length.
 - 2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.
- C. Install metal roof panels as follows:
 - 1. Field cutting of metal panels by torch is not permitted.
 - 2. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 3. Provide metal closures at each side of ridge and hip caps.
 - 4. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
 - 5. Install ridge and hip caps as metal roof panel work proceeds.
 - 6. Install metal flashing to allow moisture to run over and off metal roof panels.
- D. Fasteners:
 - 1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.

- E. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
 - 1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.
- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
 - 1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.4 METAL ROOF PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be

sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

- C. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- B. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Gutters, downspouts.

1.02 REFERENCES

- A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2002a.
- B. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1993, Fifth Edition.

1.03 SUBMITTALS

- A. See Section 013000 – Submittal Procedures, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials which may cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Gutters, Downspouts:
 - 1. Aluminum: ASTM B 209 (ASTM B 209M), 3005 alloy, H12 or H14 temper; 0.040 inch thick.
- B. Finish: Three Coat Fluoropolymer: AAMA 621 Fluoropolymer finish containing not less than 70% PVDF resin by weight in both color coat and clear top coat. Prepare, pretreat and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color selected by Architect.

2.02 ACCESSORIES

- A. Fasteners: Stainless steel, with soft neoprene washers.
- B. Underlayment: ASTM D 226, organic roofing felt, Type I ("No. 15").
- C. Protective Backing Paint: FS TT-C-494, Bituminous.
- D. Sealant: Type as is scheduled and specified in Section 07900.
- E. Plastic Cement: ASTM D 4586, Type I.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, minimum 1 1/2 inches wide, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.04 SHEET METAL FABRICATION

- A. Gutters, Downspouts: Size and profile indicated on drawings.
- B. Accessories: Profiled to suit fabrications.
 - 1. Anchorage Devices: In accordance with SMACNA requirements.
 - 2. Gutter Supports: Straps at 48" o.c. maximum.
 - 3. Downspout Supports: Straps as shown on drawings otherwise 48" o.c. maximum.
- C. Seal metal joints.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

- A. Install all fabrications in conformance with SMACMA manual
- B. Seal metal joints watertight.
- C. Secure gutters and downspouts in place using concealed fasteners.
- D. Slope gutters 1/4 inch per foot minimum.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sealants and joint backing.

1.02 REFERENCES

- A. ASTM C 834 - Standard Specification for Latex Sealants; 2000.
- B. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2002.
- C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2000.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Manufacturer's Installation Instructions: Indicate special procedures.

1.04 QUALITY ASSURANCE

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.06 COORDINATION

- A. Coordinate the work with all sections referencing this section.

1.07 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Silicone Sealants:
 - 1. Dow Corning Corp: www.dowcorning.com.
 - 2. GE Plastics: www.geplastics.com.
 - 3. Pecora Corporation: www.pecora.com.
 - 4. Tremco, Inc: www.tremcosealants.com.
 - 5. Substitutions: See Section 01600 - Product Requirements.
- B. Polyurethane Sealants:
 - 1. Pecora Corporation: www.pecora.com.
 - 2. Sonneborn Building Products, ChemRex, Inc: www.chemrex.com.
 - 3. Tremco, Inc: www.tremcosealants.com.
 - 4. Substitutions: See Section 01600 - Product Requirements.
- C. Acrylic Sealants:
 - 1. Tremco, Inc: www.tremcosealants.com.
 - 2. Substitutions: See Section 01600 - Product Requirements.

- D. Preformed Compressible Foam Sealers:
 - 1. Emseal Joint Systems, Ltd: www.emseal.com.
 - 2. Sealform Ltd ([willseal](http://willseal.com)).
 - 3. Polytite Manufacturing Corporation: www.polytite.com.
 - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 SEALANTS

- A. General Purpose Exterior Building Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single component.
 - 1. Color: as selected by architect.
 - 2. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry and concrete.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior joints for which no other sealant is indicated.
- B. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
 - 1. Color: Standard colors matching finished surfaces.
 - 2. Applications: Use for interiors only:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
- C. Bathroom Tile and Kitchen Sealant: Silicone; ASTM C 920, Uses M and A; single component, mildew resistant.
 - 1. Applications: Use for:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
 - b. Joints between kitchen and bath countertops and wall surfaces.
- D. Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Grade P, Class 25, Uses T, M and A; single component.
 - 1. Color: Standard colors matching finished surfaces.
 - 2. Applications: Use for:
 - a. Expansion joints in floors.
- E. Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Class 25, Uses T, I, M and A; multi- component.
 - 1. Color: Gray.
 - 2. Applications: Use for:
 - a. Joints in sidewalks and vehicular paving.

2.03 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- C. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C 1193.
- C. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 - 1. Width/depth ratio of 2:1.
 - 2. Neck dimension no greater than 1/3 of the joint width.
 - 3. Surface bond area on each side not less than 75 percent of joint width.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.
- H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
- I. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION OF FINISHED WORK

- A. Protect sealants until cured.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated steel doors and frames.
- B. Thermally insulated steel doors.
- C. Steel glazing frames and glass.
- D. Accessories, including louvers.

1.02 RELATED SECTIONS

- A. Section 08710 - Door Hardware.

1.03 REFERENCES

- A. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 1998.
- B. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition (ANSI/DHI A115 Series).
- C. NAAMM HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 1999.
- D. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association; 1999.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Doors and Frames:
 - 1. Ceco Door Products; Product Imperial: www.cecodoor.com.
 - 2. Republic Builders Products: www.republicdoor.com.
 - 3. Curries; Product 707 Series.
 - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 DOORS AND FRAMES

- A. Requirements for All Doors and Frames:
 - 1. Accessibility: Comply with ANSI/ICC A117.1.
 - 2. Door Edge Profile: Fully welded.
 - 3. Door Texture: Smooth faces.
 - 4. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
 - 5. Finish: Factory primed, for field finishing.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.
- C. Glazing: Refer to door schedule for glazing requirements.

2.03 STEEL DOORS

- A. Exterior Doors:
 - 1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 1, full flush, composite.
 - a. 16 gage.
 - 2. Core: Polystyrene foam permanently bonded to face sheets.
 - 3. Top Closures for Outswinging Doors: Flush with top of faces and edges.
 - 4. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with A60/ZF180 coating.
 - 5. Weatherstripping: Separate, see Section 08710.
- B. Interior Doors, Non-Fire-Rated:
 - 1. Core: Polystyrene foam.
 - 2. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 1, full flush, composite.
 - a. 16 gage.

2.04 STEEL FRAMES

- A. General:
 - 1. Comply with the requirements of grade specified for corresponding door.
 - a. ANSI A250.8 Level 3 Doors: 14 gage frames.
 - 2. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
 - 3. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
- B. Exterior Door Frames: Face welded, seamless with joints filled.
 - 1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with A60/ZF180 coating.
 - 2. Weatherstripping: Separate, see Section 08710.
- C. Interior Door Frames, Non-Fire-Rated: Fully welded type.

- D. Interior Door Frames, Fire-Rated: Fully welded type.
- E. Frames for Exterior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.
 - 1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with A60/ZF180 coating.
- F. Transom Bars: Fixed, of profile same as jamb and head.

2.05 ACCESSORY MATERIALS

- A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
 - 1. Style: Sightproof inverted V blade.
 - 2. Louver Free Area: 50 percent unless otherwise specified by mechanical drawings or specifications.
 - 3. Fasteners: Concealed fasteners.
- B. Removable Stops: Formed sheet steel, mitered corners; prepared for countersink style tamper proof screws.
- C. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

- A. Primer: Rust-inhibiting, complying with ANSI A250.10 formulated specifically for galvanized surfaces.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- B. In addition, install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
 - 1. Each side of each door frame (jamb) shall have a minimum of 3 fasteners to surrounding structure.
- D. Door frames exceeding 42" shall have additional head anchorage.
- E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

- F. Coordinate installation of hardware.
- G. Coordinate installation of glazing.
- H. Touch up damaged factory finishes.

3.04 ERECTION TOLERANCES

- A. Clearances Between Door and Frame: As specified in ANSI A250.8.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

- A. As indicated on the drawings.

END OF SECTION

SECTION 08211

FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; fire rated and non-rated.

1.02 RELATED SECTIONS

- A. Section 08110 - Steel Doors and Frames.
- B. Section 08710 - Door Hardware.
- C. Section 09900 - Paints and Coatings: Site finishing of doors.

1.03 REFERENCES

- A. AWI (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.
- B. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association; 1999.
- C. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; 1998.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing and louvers.
- D. Samples: Submit two samples of door veneer, 2x2 inch in size illustrating wood grain, stain color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Section 1300, Custom Grade.
- B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Fire Door Construction: Conform to NFPA 252.
 - 1. Listed and classified by UL as suitable to for the purpose specified and indicated.
- B. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or

wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.08 PROJECT CONDITIONS

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.09 WARRANTY

- A. See Section 01780 - Closeout Submittals for additional warranty requirements.
- B. Provide warranty for the following term:
 - 1. Interior Doors: Life of installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Veneer Doors:
 - 1. Eggers Industries: www.eggersindustries.com.
 - 2. Southwood Door Company.
 - 3. Marshfield DoorSystems, Inc: www.marshfielddoors.com. (formerly Weyerhaeuser Door Division)
 - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 DOORS

- A. All Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: AWI Architectural Woodwork Quality Standards Illustrated, Section 1300, Custom Grade.
 - 2. Wood Veneer Faced Doors: 7-ply unless otherwise indicated.
 - 3. Glazing: Refer to door schedule for glazing requirements.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at all locations.
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C or UBC Standard 7-2-97 ("positive pressure"); UL or WH (ITS) labeled without any visible seals when door is open.
 - 3. Wood veneer facing with factory transparent finish.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type PC, particleboard core, plies and faces as indicated above.
- B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above.

2.04 DOOR FACINGS

- A. Wood Veneer Facing for Transparent Finish: Select White Birch, veneer grade as specified by quality standard, rotary cut, book veneer match, running assembly match.
 - 1. Vertical Edges: Same species as face veneer.
 - 2. Pairs: Pair match each pair.
- B. Facing Adhesive: Type I - waterproof.

2.05 ACCESSORIES

- A. Metal Louvers:
 - 1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.

2. Louver Blade: Inverted V blade, sight proof.
 3. Louver Free Area: 50 percent, unless otherwise shown on the drawing documents.
- B. Glazing Stops: Wood with metal clips for rated doors, mitered corners; prepared for countersink style tamper proof screws. Metal clips are required for fire rated doors.

2.06 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Fabricate fire rated doors in accordance with UL requirements. Attach fire rating label to door.
- C. Provide solid blocks at lock edge for hardware reinforcement.
 1. Provide solid blocking for other throughbolted hardware.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Provide edge clearances in accordance with AWI Quality Standards Illustrated Section 1700.

2.07 FINISH

- A. Factory finish doors in accordance with AWI Quality Standards Illustrated, Section 1500 to the following finish designations:
 1. Transparent Finish: TR-4, transparent conversion varnish, Premium quality, satin sheen.
- B. Seal door top and bottom edge with sealer to match door facing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Trim non-rated door width by cutting equally on both jamb edges.
- C. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
 1. Trim fire door height at bottom edge only, in accordance with fire rating requirements.
- D. Refinish all trimmed edges.
- E. Use machine tools to cut or drill for hardware.
- F. Coordinate installation of doors with installation of frames and hardware.
- G. Coordinate installation of glazing.
- H. Install door louvers plumb and level.

3.03 INSTALLATION TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

3.05 SCHEDULE - See Drawings

END OF SECTION

SECTION 08331

OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Overhead coiling doors, operating hardware, non-fire-rated and exterior, electric operation.
- B. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED SECTIONS

- A. Section 13851 - Fire Alarm System: Fire alarm interconnection.
- B. Section 16155 - Equipment Wiring: Power to disconnect.
- C. Section 16131 - Conduit: Conduit from electric circuit to operator and from operator to control station.
- D. Section 16131 - Conduit: Conduit from fire alarm system.

1.03 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2001.
- B. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2002.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 1997.
- D. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000.
- E. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 1998.
- F. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, component connections and details, electrical equipment, controls.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Samples: Submit two slats, 6 x 6 inch in size illustrating shape, color and finish texture.
- E. Manufacturer's Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- F. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Overhead Coiling Doors:
 - 1. Overhead Door Corp.; Product Series 610 Heavy-Duty Rolling Service Door – partially Fenestrated: www.overheaddoor.com.
 - 2. Substitutions: See Section 01600 - Product Requirements.

2.02 COILING DOORS

- A. Exterior Coiling Doors: Steel slat curtain.
 - 1. Code Compliance: Shall be in compliance with the Florida Building Code wind load requirements.
 - 2. Wind Load Performance: Shall withstand positive and negative wind loads equal to 1.5 times design wind pressures specified by the applicable building code without damage or permanent set, when tested in accordance with ASTM E 330, using 10 second duration of maximum load.
 - 3. Single thickness slats.
 - 4. Nominal Slat Size: 2 1/2 inches wide x required length.
 - 5. Finish: Factory painted, color as selected.
 - 6. Guides: Formed track; galvanized steel.
 - 7. Hood Enclosure: Manufacturer's standard; primed steel.
 - 8. Electric operation and tied into emergency generator circuit.
 - 9. Mounting: Surface mounted.

2.03 MATERIALS

- A. Curtain Construction: Interlocking slats.
 - 1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
 - 2. Curtain Bottom: Fitted with aluminum extrusion with vinyl bottom to provide reinforcement and positive contact in closed position.
 - 3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
- B. Steel Slats: Minimum gage capable of withstanding design wind load, ASTM A 653/A 653M galvanized steel sheet.
 - 1. Flat profile type – F265.
 - 2. Provide 3 Fenestrated rows at eye level.
- C. Steel Guides: ASTM A 36/A 36M steel angles, size as required for wind loading, hot-dip galvanized per ASTM A 123/A 123M.
- D. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
 - 1. Galvanized steel.
- E. Hardware:
 - 1. Latching: Inside mounted, adjustable keeper, spring activated latch bar with feature to keep in locked or retracted position.
 - 2. Latch Handle: Interior handle.
- F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION

- A. Electric Operators:
 - 1. Model RDB heavy duty gear reduced operator manufactured by the Overhead Door Corp.

2. Mounting: Side mounted.
 3. Motor Enclosure:
 - a. Interior doors: NEMA MG 1 Type 1; open drip proof.
 4. Motor Rating: 1 hp; continuous duty, instant reverse and automatic reset thermal overload, UL listed.
 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 6. Controller Enclosure: NEMA 250 Type 1.
 7. Brake: Solenoid actuated, drum and shoe type.
 8. Manual chain hoist override in case of power failure.
- B. Control Station: Standard three button (OPEN-STOP-CLOSE) constant or momentary control for each operator.
1. 24 volt circuit.
 2. Radio control system in addition to control station.
- C. Obstruction Detection Device:
1. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to reverse operator upon striking object, hollow neoprene covered.
 2. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction. Mount no lower than 40" above finish floor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- C. Coordinate installation of electrical service with Section 16155.
- D. Complete wiring from disconnect to unit components.
- E. Complete wiring from fire alarm system .

3.03 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.04 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

SECTION 08410

ALUMINUM STOREFRONT DOOR

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum framed storefront door, glass and components.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.

1.03 REFERENCES

- A. AA DAF-45 - Designation System for Aluminum Finishes; The Aluminum Association, Inc.; 1997, Eighth Edition.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 1997.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 1998.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond to aluminum when exposed to sunlight or weather.

1.06 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Kawneer; Product for framing: Trifab 400.
- B. Other Acceptable Manufacturers:
 - 1. EFCO Corporation
 - 2. Vistawall Architectural Products: www.vistawall.com.
- C. Substitutions: See Section 01600 - Product Requirements.

2.02 COMPONENTS

- A. Aluminum Storefront Door, Frame & Hardware: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices, surface mount panic bar with HES 9600 rim mount strike. Coordinate with Access Control System provider.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M).
- B. Fasteners: Stainless steel.
- C. Perimeter Sealant: Type as specified in Section 07900.
- D. Glass in Exterior Framing: Insulated, impact resistant, light bronze tint.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.04 FINISHES

- A. Comply with AA DAF-45 for aluminum finishes required.
- B. Frame Class I, Dark Bronze Anodized Finish

2.05 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Arrange fasteners and attachments to conceal from view.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- C. Install perimeter sealant in accordance with Section 07900.

3.03 CLEANING AND PROTECTION

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.
- D. Protect finished work from damage.

END OF SECTION

SECTION 08520

ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Extruded aluminum windows with operating sash.
- B. Extruded aluminum windows with fixed glass
- B. Operating hardware.
- C. Insect screens.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.

1.03 REFERENCES

- A. AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association; 1997 with revisions contained in "reprinting" of 12/99.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 1998.
- C. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; American Architectural Manufacturers Association; 1997.
- D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2002.
- E. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991 (Reapproved 1999).
- F. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000.
- G. FS L-S-125 - Screening, Insect, Nonmetallic; Federal Specifications and Standards; Revision B, 1972.

1.04 PERFORMANCE REQUIREMENTS

- A. Design, fabricate and install windows to meet the requirements of the Florida Building Code.
 - 1. Provide Florida product approval certification including installation requirements.
- B. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.
- C. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 2.86 lbf/sq ft.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations,, and installation requirements.
- C. Certificates: Certify that windows meet or exceed specified requirements.

- D. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of AAMA 101 Designation C 35 minimum.
- B. Manufacturer: Company specializing in fabrication of commercial aluminum windows of types required, with not fewer than five years of experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Comply with requirements of AAMA CW-10.
- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.09 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 WINDOWS

- A. Basis of Design:
 - 1. PGT Winguard Series HR-710 for operable horizontal sliding window with standard meeting rail and PW-701 for fixed glass.
- B. Windows:
 - 1. Single thickness aluminum sections, factory fabricated, factory finished, vision glass, related flashings, anchorage and attachment devices.
- C. Glazing:
 - 1. Thermally broken, insulated.
 - 2. Impact resistant
 - 3. Light bronze tint

2.02 COMPONENTS

- A. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
- B. Insect Screens: FS L-S-125, woven plastic mesh; 14/18 mesh size.
- C. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.
- D. Fasteners: Stainless steel.
- E. Sealant and Backing Materials: As specified in Section 07900.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.

2.04 HARDWARE

- A. Sash lock: Lever handle with cam lock.

2.05 FABRICATION

- A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices.
- D. Arrange fasteners and attachments to ensure concealment from view.
- E. Prepare components with internal reinforcement for operating hardware.
- F. Assemble insect screen frames with mitered and reinforced corners. Secure wire mesh tautly in frame. Fit frame with four, spring loaded steel pin retainers.
- G. Single weatherstrip operable units.

2.06 FINISHES

- A. Class I , bronze anodized.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Install sill and sill end angles.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.
- G. Install perimeter sealant in accordance with requirements specified in Section 07900.

3.03 ADJUSTING AND CLEANING

- A. Remove protective material from factory finished aluminum surfaces.
- B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware sets for wood and hollow steel doors.

1.02 FURNISHED BY CONTRACTOR

- A. Contractor will provide lock sets which shall be installed under this Section.

1.03 RELATED SECTIONS

- A. Section 08110 - Steel Doors and Frames.
- B. Section 08211 - Flush Wood Doors.

1.04 REFERENCES

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.
- B. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2001.
- C. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Wood Flush Doors; Door and Hardware Institute; 1993.
- D. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2000.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- D. Keys: Coordinate delivery of keys with owner.
- E. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with five years of experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

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

1.08 COORDINATION

- A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

- B. Furnish templates for door and frame preparation.
- C. Coordinate Owner's keying requirements during the course of the Work.

1.09 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for door closers.

1.10 MAINTENANCE PRODUCTS

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Hinges: 4 1/2 x 4 1/2, provide ball bearing hinges for all closers, provide non removable hinges for all exterior locations.
 - 1. Hager Companies: www.hagerhinge.com.
 - 2. Stanley Hardware: www.stanleyworks.com.
 - 3. McKinney
- B. Lock and Latch Sets:
 - 1. Falcon lock grade 2 Cylindrical key in lever B series, 7 pin C-keyway, interchangeable core. Finish to be Satin Chrome 626
- C. Push/Pulls: Equivalent to Rockwood 107 x 70C x 70C.
 - 1. Rockwood
 - 2. Ives
- D. Closers: Equivalent to the LCN 4000 Series Smoothee. Provide hold open function for all entrance doors. Provide Cush-N-Stop where wall or floor stops are not provided. Aluminum finish.
 - 1. LCN, Div. Ingersoll-Rand Door Hardware Group.
 - 2. Sargent
- E. Wall Stops: Equivalent to Rockwood 400 Series, concealed fasteners.
 - 1. Rockwood
 - 2. Ives.
- F. Floor Stops: Equivalent to Rockwood 440 Series dome design.
 - 1. Rockwood
 - 2. Ives.
- G. Overhead Stops/Holders: Equivalent to Glynn-Johnson 90 Series Heavy Duty, hold open, stainless steel substrate.
 - 1. Glynn-Johnson: www.irco.com.
- H. Gasketing: Equivalent to Pemko S88 SiliconSeal, Bronze color.
 - 1. National Guard Products, Inc: www.ngpinc.com.
 - 2. Pemko Manufacturing Co: www.pemko.com.
- I. Protection Plates: .050 thick Stainless Steel, 16 inches high by 2 inches less than door width.
 - 1. Rockwood
 - 2. Ives
- J. Thresholds: Equivalent to Pemco 2005A with vinyl insert, 1/2 inch height.
 - 1. 1. Pemco
- K. Substitutions: See Section 01600 - Product Requirements.

2.02 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

- A. Provide products that comply with the following:
 - 1. Applicable provisions of Federal, State, and local codes.
 - 2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
 - 3. Applicable provisions of NFPA 101, Life Safety Code.
 - 4. Florida Accessibility Code.
 - 5. Americans With Disabilities Act.

2.03 KEYING

- A. Door Locks: Grand master keyed.
- B. Supply keys in the following quantities:
 - 1. 4 master keys.
 - 2. 4 grand master keys.
 - 3. 4 change keys for each lock.

2.04 FINISHES

- A. Exterior Hinges:
 - 1. US 32D - Satin Stainless Steel (BHMA 630).
- B. Interior Hinges:
 - 1. US 26D - Satin Chromium Plated Brass, Bronze (BHMA 626).
- C. Locksets, Latchsets, Etc.:
 - 1. US 26D - Satin Chromium Plated Brass, Bronze (BHMA 626).
- D. Door Closers:
 - 1. US 28 - Satin Aluminum Clear Anodized Aluminum (BHMA 628).
- E. Overhead Holders:
 - 1. US 32D - Satin Stainless Steel (BHMA 630).
- F. Wall Bumpers and Door Stops:
 - 1. US 26D - Satin Chromium Plated Brass, Bronze (BHMA 626).
- G. Push and Pull Plates:
 - 1. US 32D - Satin Stainless Steel (BHMA 630).
- H. Thresholds and Weatherstrips:
 - 1. US 27 - Satin Aluminum Clear Coated Aluminum (BHMA 627).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Provide through - bolts with grommet nuts for mounting of all overhead door closers and holders. All exposed fastening components shall be same finish at door closer or holder.
- D. Mounting heights for hardware from finished floor to center line of hardware item:
 - 1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."

2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.03 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.

3.04 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Adjust hardware for smooth operation.

3.05 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01700.
- B. Do not permit adjacent work to damage hardware or finish.

3.06 SCHEDULE

Group 1 – Aluminum Storefront Entry Door 102A

- | | |
|----------|---|
| 1 | Lockset, entrance function, with proximity card reader and lock |
| 1 ½ Pair | BB Hinges |
| 1 | Closer |
| 1 | Threshold |
| 1 Set | Weather Stripping |
| 1 | Surface mount panic bar with HES 9600 Rim mount strike |
- *Card reader supplied by Access Control sub, Door 102A hardware supplied by Aluminum Door manufacturer

Group 2 – Exterior Doors **105A, 108A, **114B, 125A, & 125F

- | | |
|----------|---|
| 1 | Lockset, entrance function, |
| 1 ½ Pair | BB Hinges |
| 1 | Closer |
| 1 | Threshold |
| 1 Set | Weather Stripping |
| 1 | Rain Cap – No rain cap required for Door 108A. |
| 1 | Kick Plate – interior side |
| 1 | Surface mount panic bar with HES 9600 Rim mount strike (Door 114B only) |
- ** proximity card reader and lock on these doors only. Coordinate HM frame requirements with Specialty Electronic Systems, Dade City, FL (352) 567-5996 Contact Kevin Dail.

Saddle Creek Fire Rescue
Polk County Board of County Commissioners
Lunz Prebor Fowler Architects

Group 3 – Interior Door 101A

1	Lockset, Classroom function
1 ½ Pair	BB Hinges
1	Closer
3	Silencers
1	Door Stop

Group 4 – Exterior Door 119A

1	Lockset, storeroom function
1 ½ Pair	Hinges
1 Set	Weather stripping
1	Rain Cap

Group 5 – Individual Toilet Doors 103A, 111A & 117A

1	Lockset, bath privacy function
1 ½ Pair	Hinges
1	Wall Stop
3	Silencers
1	Kick Plate -- interior side

Group 6 – Bedroom Doors 113A & 115A

1	Lockset, bedroom privacy function
1 ½ Pair	Hinges
1	Wall Stop
3	Silencers

Group 7 – Passage Doors 101B, 106A, 112A, *114A, 116A, 120A, *121A, 122A, 122B

1	Lockset, passage function
1 ½ Pair	Hinges
1	Wall stops where required
1	*Closer (114A & 121A)

Group 8 -- Office Doors 105B, 107A & 107B

1	Lockset, office function
1 ½ Pair	Hinges
1	Wall Stop
3	Silencers

END OF SECTION 08710

SECTION 09206

METAL LATH

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal lath for portland cement plaster.

1.02 RELATED SECTIONS

- A. Section 09220 - Portland Cement Plaster.

1.03 REFERENCES

- A. ASTM C 847 - Standard Specification for Metal Lath; 1995 (reapproved 2000).

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Lath:
 - 1. Alabama Metal Industries Corporation: www.amico-online.com.
 - 2. Dale/Incor: www.daleincor.com.
 - 3. Western Metal Lath, Inc: www.wmlinc.com.
 - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 LATH

- A. Diamond Mesh Metal Lath: ASTM C 847.
 - 1. Weight: To suit application, comply with deflection criteria, and as specified in ASTM C 841 for framing spacing.
 - 2. Minimum Weight: 3.4 lb/sq yd.
 - 3. Galvanized.
- B. Casing Beads: Formed zinc, depth governed by plaster thickness, maximum possible lengths, expanded metal flanges, with square edges; galvanized for interior.
- C. Corner Beads: Formed zinc, depth governed by plaster thickness, maximum possible lengths, expanded metal flanges with radiused edge; galvanized for interior.
- D. Base Screeds: Formed zinc, depth governed by plaster thickness, maximum possible lengths, expanded metal flanges, with beveled edge; galvanized for interior.

2.03 ACCESSORIES

- A. Underlayment: Asphalt-saturated organic felt underlayment, complying with ASTM D 4869, minimum 8 lb/100 sq ft (Type I).
- B. Anchorage: 18 gage soft annealed tie wire, nails, and other metal clips/supports, of type and size to suit application; to rigidly secure materials in place, galvanized.

- C. Fasteners: ASTM C 1002 self-piercing tapping screws.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that substrates are ready to receive work and conditions are suitable for application.

3.02 INSTALLATION - GENERAL

- A. Install lath for plaster work in accordance with ASTM C 841.

3.03 UNDERLAYMENT

- A. Install over all sheathed (wood) surfaces.
- B. Install underlayment horizontally with ends and edges weather lapped minimum 4 inches. Stagger end laps of each consecutive layer.
- C. Seal all laps with asphaltic mastic.

3.04 CONTROL JOINTS

- A. Locate joints as indicated on drawings.

3.05 LATH INSTALLATION

- A. Apply metal lath taut, with long dimension horizontal.
- B. Lap sides of diamond mesh lath minimum 1-1/2 inches.
- C. Expansion trim pieces are to be fastened at 6 inch centers (both sides).
- D. Trim pieces other than expansion trim pieces are to be fastened at 12 inch centers.
- E. Place corner bead at external wall corners; fasten at outer edges of lath only.
- F. Place base screeds at termination of plaster areas; secure rigidly in place.
- G. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.
- H. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.
- I. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.
- J. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

END OF SECTION

SECTION 09220

PORTLAND CEMENT PLASTER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Portland cement plaster for installation over metal lath and solid surfaces.

1.02 RELATED SECTIONS

- A. Section 09206 - Metal Lath: Metal furring and lathing for plaster.

1.03 REFERENCES

- A. ASTM C 91 - Standard Specification for Masonry Cement; 2001.
- B. ASTM C 926 - Standard Specification for Application of Portland Cement-Based Plaster; 1998a.
- C. ASTM C 932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering; 1998a.
- D. PCA EB049M - Portland Cement Plaster (Stucco) Manual; Portland Cement Association; 1996.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide data on plaster materials, characteristics and limitations of products specified.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ASTM C 926.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

1.06 MOCK-UP

- A. Construct mock-up of exterior wall, 6 feet long by 6 feet wide, illustrating surface finish.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply plaster when substrate or ambient air temperature is under 50 degrees F or over 80 degrees F.

PART 2 PRODUCTS

2.01 PLASTER MATERIALS

- A. Masonry Cement: ASTM C 91 Type S.
 - 1. Florida Super Stucco Cement manufactured by Lafarge Corporation.
 - 2. Shall contain a water repellent agent.
- B. Aggregate: In accordance with ASTM C 926.
- C. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.
- D. Bonding Agent: ASTM C 932; type recommended for bonding plaster to concrete and concrete masonry surfaces; Euco Weld manufactured by The Euclid Chemical Company.

2.02 METAL LATH

- A. Metal Lath and Accessories: As specified in Section 09206.

2.03 PLASTER MIXES

- A. Over Solid Bases: Two-coat application, mixed and proportioned in accordance with ASTM C 926.
- B. Over Metal Lath: Three-coat application, mixed and proportioned in accordance with ASTM C 926.
- C. Mix only as much plaster as can be used prior to initial set.
- D. Mix materials dry, to uniform color and consistency, before adding water.
- E. Protect mixtures from freezing, frost, contamination, and excessive evaporation.
- F. Do not retemper mixes after initial set has occurred.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify the suitability of existing conditions before starting work.
- B. Underlayment: Verify that all sheathed surfaces are covered without gaps or tears.
- C. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.
- D. Mechanical and Electrical: Verify services within walls have been tested and approved.

3.02 PREPARATION

- A. Dampen masonry surfaces to reduce excessive suction.
- B. Clean concrete surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.
- C. Roughen smooth concrete surfaces and apply bonding agent in accordance with manufacturer's instructions.

3.03 PLASTERING

- A. Apply premixed plaster in accordance with manufacturer's instructions.
- B. Two-Coat Application:
 - 1. Apply first coat to nominal thickness of 3/8 inch.
 - 2. Apply finish coat to nominal thickness of 1/8 inch.
- C. Three-Coat Application Over Metal Lath:
 - 1. Apply first coat to a nominal thickness of 3/8 inch.
 - 2. Apply second coat to a nominal thickness of 3/8 inch.
 - 3. Apply finish coat to a nominal thickness of 1/8 inch.
- D. Moist cure base coats.
- E. Apply second coat immediately following initial set of first coat.
- F. After curing, dampen previous coat prior to applying finish coat.
- G. Finish Texture: Float to a consistent and smooth sand finish, typical.
- H. Tool exterior application to match jointing of CMU.

- I. Avoid excessive working of surface. Delay troweling as long as possible to avoid drawing excess fines to surface.
- J. Moist cure finish coat for minimum period of 48 hours.

END OF SECTION

SECTION 09260

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal stud wall framing.
- B. Metal channel ceiling framing.
- C. Gypsum wall board.
- D. Cementitious backer board.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.

1.02 RELATED SECTIONS

- A. Section 06114 - Wood Blocking and Curbing: Wood blocking for support of wall-mounted equipment.
- B. Section 07212 - Board and Batt Insulation: Wall and ceiling insulation.
- C. Section 07900 - Joint Sealers: Acoustic sealant.

1.03 REFERENCES

- A. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 1999.
- B. ASTM C 36/C 36M - Standard Specification for Gypsum Wallboard; 2001.
- C. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002.
- D. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2000.
- E. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2002.
- F. ASTM C 931/C 931M - Standard Specification for Exterior Gypsum Soffit Board; 1998.
- G. GA-253 - Recommended Specifications for the Application of Gypsum Sheathing; Gypsum Association; 1999.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, joint finishing system, and accessories.
- C. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 x 12 inches in size, illustrating finish color and texture.

1.05 QUALITY ASSURANCE

- A. Perform in accordance with ASTM C 840.
- B. Applicator Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gypsum Board:
 - 1. G-P Gypsum Corporation: www.gp.com.
 - 2. National Gypsum Company: www.nationalgypsum.com.
 - 3. USG Corporation: www.usg.com.
 - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Metal Framing:
 - 1. Clark Steel Framing Systems; www.clarksteel.com.
 - 2. Dale/Incor; www.daleincor.com.
 - 3. Dietrich Metal Framing, Inc; www.dietrichindustries.com.
 - 4. Substitutions: See Section 01600 - Product Requirements.
- C. Metal Framing Connectors and Accessories:
 - 1. Same manufacturer as framing.

2.02 METAL FRAMING MATERIALS

- A. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Studs: C shaped with knurled faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C shaped.
 - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- B. Ceiling Hangers: Type and size as specified in ASTM C 754 for spacing required.
- C. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.

2.03 GYPSUM BOARD MATERIALS

- A. Gypsum Wallboard: ASTM C 36/C 36M and ASTM C 1396/C 1396M. Sizes to minimize joints in place; ends square cut.
 - 1. Regular Type:
 - a. Application: Use for vertical surfaces, unless otherwise indicated.
 - 2. Thickness: 5/8 inch.
 - 3. Edges: Tapered.
- B. Type X: Fire resistant, UL or WH rated.
 - 1. Application: Where required for fire-rated assemblies, unless otherwise indicated.
 - 2. Thickness: 5/8 inch.
 - 3. Edges: Tapered.
- C. Exterior Gypsum Ceiling Board: ASTM C 931/C 931M and ASTM C 1396/C 1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Ceilings and soffits in protected exterior areas and non-conditioned interior spaces, unless otherwise indicated.
 - 2. Core Type: Regular, weather and sag resistant.
 - 3. Thickness: 1/2 inch.
 - 4. Edges: Tapered.
- D. Cementitious Backer Board: ANSI A118.9, aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces.
 - 1. Application: Bathroom walls.

2. Thickness: 1/2 inch.

2.04 ACCESSORIES

- A. Corner Beads: Galvanized steel.
- B. Edge Trim: Bead type(s) as detailed.
- C. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
 1. Tape: 2 inch wide, coated glass fiber tape for joints and corners.
 2. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 3. Ready-mixed vinyl-based joint compound.
 4. Chemical hardening type compound.
- D. Textured Finish Materials: Latex-based compound; containing fine aggregate.
- E. Screws: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Comply with ASTM C 754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center.
 1. Level ceiling system to a tolerance of 1/1200.
 2. Laterally brace entire suspension system.
- C. Studs: Space studs at 16 inches on center.
 1. Extend partition framing to structure in all locations.
 2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Blocking: Install blocking for support of wall cabinets, toilet accessories, and hardware. Comply with Section 06114 for wood blocking.

3.03 GYPSUM BOARD INSTALLATION

- A. Comply with ASTM C 840. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Single-Layer Fire-Rated: Install gypsum board vertically, with edges and ends occurring over firm bearing.
- D. Gypsum Ceiling Board: Install perpendicular to framing, with staggered end joints over framing members or other solid backing.
- E. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

- F. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

- A. Corner Beads: Install at external corners, using longest practical lengths.
- B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.05 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C. Finish gypsum board in scheduled areas in accordance with levels defined in ASTM C 840 and as scheduled below.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.06 TEXTURE FINISH

- A. Wall surfaces shall have a smooth level 4 or 5 finish with no texture. See Level Schedule, Section 3.08.
- B. Ceiling and soffit surfaces shall have smooth level 4 or 5 finish with no texture. See Level Schedule, Section 3.08.

3.07 TOLERANCES

3.08 FINISH LEVEL SCHEDULE

- A. Level 1: Above finished ceilings concealed from view.
 - 1. Tape in joint compound at joints and interior angles. Tool marks and ridges acceptable.
- B. Level 2: Utility areas and areas behind cabinetry.
 - 1. Level 1, plus separate coat of compound at joints, angles, fasteners, and accessories. Tool marks and ridges acceptable.
- C. Level 3: Walls and ceilings scheduled to receive textured wall finish.
 - 1. Level 1, plus two separate coats of compound at joints, angles, fasteners, and accessories. Compound shall be smooth and free of tool marks and ridges.
- D. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish.
 - 1. Level 1, plus three separate coats of compound at joints, angles, fasteners, and accessories. Compound shall be smooth and free of tool marks and ridges.
- E. Level 5: Walls and ceilings scheduled to receive semi-gloss or gloss paint finish.
 - 1. Level 4, plus separate skim coat of compound over entire surface of gypsum board.

END OF SECTION

SECTION 09300

TILE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for restroom floor, shower floor and wall applications, including ceramic mosaic floor tile and cove base.
- B. Tile for floor applications.
- C. Tile for wall applications.
- D. Ceramic accessories.
- E. Ceramic trim.

1.02 RELATED SECTIONS

- A. Section 09260 - Gypsum Board Assemblies: Installation of tile backer board.

1.03 REFERENCES

- A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 1999.
 - 1. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999.
 - 2. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 1999.
 - 3. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 1988.
- B. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of America, Inc.; 2002.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Samples: Two samples (2"x2" sample material size) of full color and texture range offered by approved or (below) listed manufacturer.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

1.06 MOCK-UP

- A. See Section 01400 - Quality Requirements, for general requirements for mock-up.
- B. Construct tile mock-up where directed, incorporating all components specified for the location.
- C. Minimum size of mock-up is a 48" x 48" area for both wall and floor; include base condition..

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not install adhesives in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

1.08 EXTRA MATERIALS

- A. Provide 2 percent of each size, color, and surface finish of tile specified, but not less than 10 of each type.

PART 2 PRODUCTS

2.01 TILE

- A. Manufacturers:
 - 1. American Olean: www.americanolean.com.
 - 2. Dal-Tile: www.daltile.com.
 - 3. Florida Tile.
 - 4. Substitutions: See Section 01600 - Product Requirements.
- B. Tile Colors and Textures:
 - 1. Provide the manufacturer's full range of colors (price groups 1 and 2) and textures for selection by the architect.
 - 2. A minimum of six colors may be selected.
 - 3. Allow for 20 percent of the color range to be a premium level accent color.
- C. Ceramic Mosaic Tile for floor and cove base: ANSI A137.1, and as follows:
 - 1. Moisture Absorption: 0 to 0.5 percent.
 - 2. Size and Shape: 2 inch square.
 - 3. Edges: Cushioned.
 - 4. Surface Finish: slip resistant on floor surfaces.
 - 5. Colors: selected by architect.
 - 6. Trim Units: Matching bead, cove, and surface bullnose shapes in sizes coordinated with field tile.
- D. Glazed Wall Tile: ANSI A137.1, and as follows:
 - 1. Moisture Absorption: 3.0 to 7.0 percent.
 - 2. Size and Shape: 4-1/4 inch square.
 - 3. Edges: Cushioned.
 - 4. Surface Finish: Matte glaze.
 - 5. Colors: selected by architect.
 - 6. Trim Units: Matching bead, bullnose, and cove shapes in sizes coordinated with field tile.

2.02 TRIM AND ACCESSORIES

- A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.
- B. Solid surface soap dish: clam shell design, surface mounted; cast strength sufficient to resist lateral pull force of 75 lbs.
- C. Toilet Tissue Holder: Recessed, for single roll, with spring loaded holder.
- D. Towel Bars: Standard design, surface mounted with extensions for casting into small wall openings; cast strength sufficient to resist lateral pull force of 30 lbs.
- E. Ceramic Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
 - 1. Applications: Use in the following locations:
 - a. Open Edges: Bullnose.
 - b. Inside Corners: Coved.
 - c. Floor to Wall Joints: Cove base.
 - 2. Manufacturer: Same as for tile.
- F. Thresholds: Marble, gray, honed finish; 2 inches wide by full width of wall or frame opening; 1/2

inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.

1. Applications: Provide at the following locations:
 - a. At doorways where tile terminates.
 - b. At open edges of floor tile where adjacent finish is a different height.

2.03 ADHESIVE MATERIALS

- A. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.

2.04 MORTAR MATERIALS

- A. Mortar Bed Materials: Portland cement, sand, latex additive and water in accordance with ANSI A108.1A..
- B. Mortar Bond Coat Materials:
 1. Dry-Set Portland Cement type: ANSI A118.1.

2.05 GROUT MATERIALS

- A. Manufacturers:
 1. W.R. Bonsal Co: www.bonsal.com.
 2. Bostik: www.bostik.com.
 3. Custom Building Products: www.custombuildingproducts.com.
 4. Substitutions: See Section 01600 - Product Requirements.
- B. Standard Grout: Standard sanded cement grout, as specified in ANSI A118.6.
- C. Color: Selected from manufacturers standard range. Two colors may be selected.

2.06 ACCESSORY MATERIALS

- A. Sealer: 511 Empregator Silicon Sealer, by Miracle, or approved equal.
- B. Waterproofing Membrane at Showers: 0.040 inch nominal thickness Chlorinated Polyethylene complying with ANSI A118.10.
 1. Product: Chloraloy as manufactured by The Noble Company, or approved equal.
- C. Reinforcing Mesh: 2 x 2 inch size weave of 16/16 wire size; welded fabric, galvanized.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, 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.
- 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 the following limits:
 1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
 2. Alkalinity: pH range of 5-9.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable

flatness tolerances.

- D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. All wall tile shall be installed over cementitious backer units.
- B. Floor Tile Sealer - Apply after tile and grout are set, cured and cleaned, and per manufacturer's recommendations, to all tile floors listed in this section of the specifications.
- C. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.
- D. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- E. Place thresholds at exposed tile edges.
- F. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor and base joints.
- G. 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.
- H. Form internal angles coved and external angles bullnosed.
- I. Install ceramic accessories rigidly in prepared openings.
- J. Install thresholds where indicated.
- K. Sound tile after setting. Replace hollow sounding units.
- L. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- M. Allow tile to set for a minimum of 48 hours prior to grouting.
- N. Grout tile joints. Use standard grout unless otherwise indicated..
- O. Apply sealer to floor tile at time of initial installation.
- P. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - MORTAR BED METHODS

- A. Over interior concrete substrates, install in accordance with TCA Handbook Method F121 with waterproof membrane, unless otherwise indicated.
- B. Waterproofing Membrane: Install as specified in ANSI A108.13.
- C. Mortar Bed Thickness: 1-1/4 inch minimum to 2" maximum per TCA Handbook recommendations..

3.05 INSTALLATION - SHOWERS

- 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. Grout with standard grout as specified above.
- C. Seal joints between tile work and other work with sealant type as specified in Section 07900.

3.06 INSTALLATION - WALL TILE

- A. Over cementitious backer units install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat , unless otherwise indicated.

3.07 CLEANING

- A. Clean tile and grout surfaces.

3.08 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over finished floor surface for 4 days after installation.
- B. Protect floor finish with coverings until final inspection.

END OF SECTION

SECTION 09650

RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.02 REFERENCES

- A. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2003.
- B. ASTM F 1066 - Standard Specification for Vinyl Composition Floor Tile; 1999.
- C. ASTM F 1861 - Standard Specification for Resilient Wall Base; 2002.

1.03 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.05 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Provide 1% of sq ft of flooring, 1% of lineal feet of base, of each type and color specified.

PART 2 PRODUCTS

2.01 MATERIALS - TILE FLOORING

- A. Tile Colors:
 - 1. Provide the manufacturer's full range of colors for selection by architect.
 - 2. A maximum of 4 colors per room may be selected.
 - 3. Allow for 20 percent of the color range to be a premium level accent color.
- B. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness, and:
 - 1. Minimum Requirements: Comply with ASTM F 1066, of Class corresponding to type specified.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 - 3. Size: 12 x 12 inch.

4. Thickness: 1/8 inch.
5. Manufacturers:
 - a. Armstrong World Industries, Inc; Product Excelon Imperial Texture: www.armstrong.com.
 - b. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS - BASE

- A. Resilient Base: ASTM F 1861, Type TV, vinyl, thermoplastic; top set cove, and as follows:
 1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
 2. Height: 4 inch unless otherwise indicated on the drawings.
 3. Thickness: 0.125 inch thick.
 4. Finish: Satin.
 5. Length: Roll.
 6. Color: Color as selected from manufacturer's standards.
 7. Manufacturers:
 - a. BurkeMercer Flooring Products, Inc: www.burkemercer.com.
 - b. Johnsonite, Inc: www.johnsonite.com.
 - c. Roppe Corp: www.roppe.com.
 - d. Substitutions: See Section 01600 - Product Requirements.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Moldings and Edge Strips: vinyl or rubber.
 1. Colors: As selected by architect.
- D. Substitutions: See Section 01600 - Product Requirements.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive resilient flooring.
- B. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, and are ready to receive resilient base.
- C. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of adhesive materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
 1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
 2. Alkalinity: pH range of 5-9.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - TILE FLOORING

- A. Install in accordance with manufacturer's instructions.
- B. Mix tile from container to ensure shade variations are consistent when tile is placed.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Set flooring in place, press with heavy roller to attain full adhesion.
- E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
- F. Where floor joints are different on opposite sides of door and floor pattern is not otherwise directed or shown on the drawings, terminate flooring under centerline of door and incorporate a feature strip.
- G. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
- H. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.
- C. Scribe and fit to door frames and other interruptions.

3.05 CLEANING

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

3.06 PROTECTION OF FINISHED WORK

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09680

CARPET

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet, direct-glued.
- B. Accessories.

1.02 RELATED SECTIONS

- A. Section 09650-RESILIENT FLOORING: Base finish.

1.03 REFERENCES

- A. ASTM D 2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2002.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2001.
- C. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2003.
- D. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; 1996.
- E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2000.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings.
- C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- D. Samples: Submit two samples 8x8 inch in size illustrating color and pattern for each carpet material specified.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- F. Certificates of Compliance: Certified test reports that tuft bind, static control, edge ravel, secondary backing delamination, stain resistance, Green Label Program, and flammability properties are met.
- G. Guarantees: As listed under Quality Assurance below.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum 10 years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet with minimum 5 years experience.
- C. Installer warranty: Two year, covering installation and workmanship.

- D. Wear warranty : Life of carpet, no more than 10% face yarn loss by weight in normal use.
- E. Static Protection: Life of Carpet, protection from static discharge as stated in Part 2 Products.
- F. Tuft bind warranty: Life of carpet, 20 lb. maintained wet or dry.
- G. Edge ravel warranty: Life of carpet, edge will not ravel at the seams either wet or dry.
- H. Backing delamination warranty: Life of carpet, the secondary backing will not delaminate; chair pads are not required when carpet is installed direct to floor.
- I. Stain Resistant Properties: Shall be permanent, not topical or removable by commercial cleanings or abrasive wear.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Carpet and adhesive system components must meet or exceed qualifications for environmental standards of the Carpet and Rug Institute's Green Label Program.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.
- D. Ventilate installation area during installation and for 72 hours after installation.

1.07 DELIVERY AND STORAGE

- A. Deliver in original protective wrapping with registration numbers and tags attached.
- B. Deliver to job site at least 36 hours prior to installation to allow carpet to adjust to room conditions.
- C. Store in safe, clean, and well ventilated area.
- D. Store rolls flat, do not stack.

1.08 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional requirements.
- B. Provide 3% of carpeting of each type, color, and pattern specified.

PART 2 PRODUCTS

2.01 CARPET

- A. Colors and Patterns:
 - 1. A minimum of two colors per room may be selected; more if indicated on the drawing documents.
 - 2. Provide a minimum of 20 colors (solids) and 20 colors (patterns) for each type of carpet listed herein; for selection by the architect.
- B. Carpet: Tufted and multi level loop graphic, nylon type 6.6 hollow core continuous filament, conforming to the following criteria:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84.
 - 2. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E 648 or NFPA 253.
 - 3. Surface Flammability Ignition: Pass ASTM D 2859 (the "pill test").
 - 4. Specific Optical Density: 450 or less, when tested in accordance with NFPA 258 or ASTM E 662.
 - 5. Lightfastness: Gray scale rating of 4 or better after 180 standard fading hours as compared to AATC Gray Scale for evaluation change in color, when tested in accordance with AATC

- 16E.
- 6. Ozone and Gas: Rating 3 or better per floor AATCC transference scale, when tested in accordance with AATCC 129.
- 7. Color: to be selected by the architect.
- 8. Dye Method: Solution or yarn.
- 9. Pattern: to be selected by the architect.
- 10. Roll Width: 12/15 ft.
- 11. Max. Electrostatic Charge: 3 Kv. @ 20 percent R.H at 70 degrees, when tested in accordance with AATCC 134.
- 12. Tuft Bind: 20 lb. maintained wet or dry, when tested in accordance with ASTM D 1335.
- 13. Soil Resistance: Scotchgard Commercial or equivalent.
- 14. Gage: 1/10 or 1/8 inch.
- 15. Stitches: 8 per inch, minimum.
- 16. Pile Height: .094 in. low, .218 in. high.
- 17. Yarn Size: 4000/2 denier/ply, minimum.
- 18. Pile Weight: 28 oz/sq yd.
- 19. Primary Backing:
 - a. Material: Polypropylene.
- 20. Secondary Backing:
 - a. Material: Unibond, PVC or other 100% synthetic.
 - b. Shall not allow growth of mold or mildew.

2.02 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by carpet manufacturer.
- B. Moldings and Edge Strips: Rubber, color as selected.
- C. Seam Adhesive: Recommended by manufacturer.
 - 1. 1. Non solvent based releasing no VOC's.
- D. Contact Adhesive: Recommended by carpet manufacturer; releasable type.
 - 1. Non solvent based releasing no VOC's.
- E. Miscellaneous Materials: As recommended by the carpet manufacturer and installer for the conditions of installation and use.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of adhesives to sub floor surfaces.
- B. Verify that concrete sub-floor surfaces are ready for carpet installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
 - 1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
 - 2. Alkalinity: pH range of 5-9.
- C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Install carpet and cushion in accordance with manufacturer's instructions and CRI 104.
- B. Verify carpet match before cutting to ensure minimal variation between dye lots.
- C. Lay out carpet and locate seams in accordance with shop drawings:
 - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
 - 2. Do not locate seams perpendicular through door openings.
 - 3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
 - 4. Locate change of color or pattern between rooms under door centerline.
 - 5. Provide monolithic color, pattern, and texture match within any one area.
- D. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.04 DIRECT-GLUED CARPET

- A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
- B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
- C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.
- D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
- E. Trim carpet neatly at walls and around interruptions.
- F. Complete installation of edge strips, concealing exposed edges.

3.05 CLEANING

- A. Remove excess adhesive from floor and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Plaster.
 - 4. Steel.
 - 5. Galvanized metal.
 - 6. Aluminum (not anodized or otherwise coated).
 - 7. Wood.
 - 8. Gypsum board.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

- B. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Masonry (Clay and CMU): 12 percent.
 - 2. Wood: 15 percent.
 - 3. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove surface oxidation.

H. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

1. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

- a. Uninsulated metal piping.
- b. Uninsulated plastic piping.
- c. Pipe hangers and supports.
- d. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
- e. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
- f. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

- a. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

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

3.6 INTERIOR PRIMER SCHEDULE

- A. Interior Gypsum Board Primer: Latex-based primer for interior application of WB Epoxy or any water based paints.
 - 1. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
 - 2. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
 - 3. Porter Paints; Pro-Master 2000 Interior Latex Primer/Sealer No. 867: Applied at a dry film thickness of not less than 1.1 mils (0.028 mm).
- B. Interior Wood Primer for Acrylic-Enamel and Semigloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
 - 1. Pittsburgh Paints; 6-855 SpeedHide Latex Enamel Undercoater: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
 - 2. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
 - 3. Sherwin-Williams; PrepRite Classic Interior Primer B28W101 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
 - 4. Porter Paints; Pro-Master 2000 Fast Dry Enamel Undercoat No. 6064: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

- C. Interior Wood Primer for Full-Gloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
 - 1. Pittsburgh Paints; 6-6 SpeedHide Interior Quick-Drying Enamel Undercoater: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
 - 2. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
 - 3. Porter Paints; Pro-Master 2000 Fast Dry Enamel Undercoat No. 6064: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
- D. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
 - 1. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
 - 2. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 - 3. Porter Paints; Porter Guard Alkyd Metal Primer No. 272/276: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
- E. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.
 - 1. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 - 2. Sherwin-Williams; primer not required over this substrate.
 - 3. Sherwin-Williams; Galvite HS B50WZ30: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 - 4. Porter Paints; Porter Guard DTM Acrylic Primer/Finish No. 212/215: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

3.7 INTERIOR FINISH COAT SCHEDULE

- A. Interior Flat Acrylic Paint: Apply two (2) coats to all drywall ceilings unless noted otherwise.
 - 1. Pittsburgh Paints; 6-70 Line SpeedHide Interior Wall Flat-Latex Paint: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
 - 2. Sherwin-Williams; ProMar 200 Interior Latex Flat Wall Paint B30W200 Series: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
 - 3. Porter Paints; Pro-Master 2000 Flat Interior Latex Wall Paint No. 6109: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
- B. Interior Semi-gloss Water Borne Acrylic Epoxy. Apply two (2) coats drywall & masonry walls where called for on finish schedule. Intent is to achieve eggshell finish for ease of cleaning ALL interior walls.
 - 1. Pittsburgh Paints; 16-551 Series Pitt-Glaze WB Water Borne Acrylic Epoxy Applied at a dry film thickness of not less than 2.0 mils (0.038 mm) per coat.

2. Sherwin-Williams; B - 70W Water Born Acrylic Epoxy. Applied at a dry film thickness of not less than 2.0 mils (0.038 mm) per coat.
- C. Interior Full-Gloss Alkyd Enamel. Apply two (2) coats for Metal Surfaces such as hollow metal.
1. Pittsburgh Paints; 7-814 Series Pittsburgh Paints Industrial Gloss-Oil Interior/Exterior Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
 2. Sherwin-Williams; ProMar 200 Alkyd Gloss Enamel B35W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
 3. Porter Paints; Porter Guard Fast Dry Alkyd Enamel No. 2749: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

3.8 EXTERIOR PRIMER SCHEDULE

- A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.
4. Pittsburgh Paints; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 6.0 to 12.5 mils (0.152 to 0.318 mm).
 5. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils (0.203 mm).
 6. Porter Paints; Pro-Master 2000 Interior/Exterior Latex Block Filler No. 6223: Applied at a dry film thickness of not less than 5.2 to 16 mils (0.132 to 0.406 mm).
- B. Exterior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application. (Apply after block filler.)
1. Pittsburgh Paints; 4-603 Perma-Crete Interior/Exterior Acrylic Alkali Resistant Primer: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 2. Sherwin-Williams; Loxon Exterior Masonry Acrylic Primer A24W300: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 3. Porter Paints; PorterLock WB Acrylic Pigmented Sealer No. 6010: Applied at a dry film thickness of not less than 0.8 mils (0.020 mm).
- C. Exterior Wood & Cement Board Primer for Acrylic Enamels: Factory-formulated alkyd or latex wood primer for exterior application.
1. Pittsburgh Paints; 6-609 SpeedHide Exterior House & Trim Wood Primer 100 Percent Acrylic Latex: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
 2. Sherwin-Williams; A-100 Exterior Latex Wood Primer B42W41: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
 3. Porter Paints; Acri-Pro 100 Acrylic Primer No. 335: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
- D. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
1. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 2. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 3. Porter Paints; Porter Guard Alkyd Metal Primer No. 272/276: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
- E. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.
1. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

2. Sherwin-Williams; Galvite HS Paint B50WZ3: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
3. Porter Paints; Porter Guard DTM Acrylic Primer/Finish No. 212/215: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

Retain primer below over exterior aluminum substrates under semigloss and full-gloss acrylic finishes.

- F. Exterior Aluminum Primer under Acrylic Finishes: Factory-formulated acrylic-based metal primer for exterior application.
1. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 2. Sherwin-Williams; DTM Acrylic Primer/Finish B66W1: Applied at a dry film thickness of not less than 2.5 mils (0.064 mm).
 3. Porter Paints; Porter Guard DTM Acrylic Primer/Finish No. 212/215: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- G. Exterior Aluminum Primer under Alkyd Finishes: Factory-formulated acrylic-based metal primer for exterior application.
1. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 2. Sherwin-Williams; DTM Wash Primer B71Y1: Applied at a dry film thickness of not less than 2.5 mils (0.064 mm).
 3. Porter Paints; Porter Guard DTM Acrylic Primer/Finish No. 212/215: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

3.9 EXTERIOR FINISH COAT SCHEDULE

- A. Exterior Flat Acrylic Paint: Apply two (2) coats to Gypsum Board, Masonry and Wood.
1. Pittsburgh Paints; 72-45 Sun-Proof Exterior House Paint Flat Latex: Applied at a dry film thickness of not less than 1.4 mils (0.035 mm).
 2. Sherwin-Williams; Super Paint Series Exterior Latex Flat House Paint A80 Series: Applied at a dry film thickness of not less than 1.4 mils (0.035 mm).
 3. Porter Paints; Acri-Shield #520 Exterior Acrylic Paint : Applied at a dry film thickness of not less than 1.4 mils (0.035 mm).
- B. Exterior Full-Gloss Acrylic Enamel. Apply two (2) coats to Ferrous and Other Metals:
1. Pittsburgh Paints; 90-300 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 2. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils (0.061 mm).
 3. Porter Paints; Porter Guard DTM Acrylic Gloss Enamel No. 2909: Applied at a dry film thickness of not less than 2.5 mils (0.063 mm).

END OF SECTION

SECTION 09901

PRODUCT EQUIVALENCY FORM - PAINT

IN ORDER FOR OUR FIRM TO APPROVE YOUR PRODUCTS AS EQUIVALENT TO THE ORIGINAL PAINT SPECIFICATIONS, WE NEED THE INFORMATION LISTED BELOW FOR EACH PRODUCT PROPOSED FOR USE.

1.01 PRODUCT SPECIFIED (include manufacturer's name):

A. _____

1.02 PROPOSED EQUIVALENT PRODUCT (include manufacturer's name):

A. _____

B. Proposed Product Data:

1. What is the weight per gallon:
 - a. _____
2. Percent solids by WEIGHT:
 - a. _____
3. Percent solids by VOLUME:
 - a. _____
4. Percent pigment volume concentration (PVC):
 - a. _____
5. Percent total PIGMENT by weight:
 - a. _____
6. What percent of the PIGMENT by weight is:
 - a. TiO₂ _____
 - b. _____
 - c. Silicates _____
 - d. _____
 - e. Zinc Oxide _____
 - f. _____
 - g. Calcium Carbonate _____
 - h. _____
 - i. Other Pigments (identify) _____
 - j. _____
7. Percent of VEHICLE by weight:
 - a. _____
8. What percent of VEHICLE by weight is:
 - a. Acrylic Resin _____
 - b. _____
 - c. Alkyd Resin _____
 - d. _____
 - e. Other Resins (identify) _____
 - f. _____
 - g. Water or solvent? _____
 - h. _____
9. What is the Volatile Organic Compound (V.O.C.) as supplied?
 - a. _____
10. FOR FINISH OR TOP-COAT PRODUCTS
 - a. What is the 60 degree angular sheen? (satin or higher) _____
 - b. _____
 - c. What is the 85 degree angular sheen? (flat or matte) _____
 - d. _____
 - e. Is the product offcasted (pigments added to increase hiding power)? _____
 - f. _____
 - g. If so, what color is added? _____
 - h. _____

END OF SECTION - PRODUCT EQUIVALENCY FORM - PAINT

SECTION 10210

WALL LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Louvers, frames, and accessories.

1.02 RELATED SECTIONS

- A. Section 07900 - Joint Sealers.

1.03 REFERENCES

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2002.
- B. AMCA 511 - Certified Ratings Program for Air Control Devices; Air Movement and Control Association International, Inc.; 1999.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, tolerances; head, jamb and sill details; blade configuration, screens, blankout areas required, and frames.

1.05 QUALITY ASSURANCE

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

1.06 WARRANTY

- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.
 - 1. Finish: Include coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wall Louvers:
 - 1. The Airolite Company: www.airolite.com.
 - 2. American Warming and Ventilating: www.american-warming.com.
 - 3. Conspec Systems, Inc: www.c-sgroup.com.
 - 4. Greenheck: www.greenheck.com
 - 5. Substitutions: See Section 01600 - Product Requirements.

2.02 LOUVERS

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified under AMCA 511.
 - 1. Wind Load Resistance: Design to resist positive and negative wind load as required by code without damage or permanent deformation.
 - 2. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
 - 3. Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

- B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with concealed intermediate mullions.
 - 1. Free Area: 50 percent, minimum.
 - 2. Blades: Straight.
 - 3. Frame: 4 inches deep, channel profile; corner joints mitered and mechanically fastened, with continuous recessed caulking channel each side.
 - 4. Metal Thickness: Frame 0.081 inch; blades 0.081 inch.
 - 5. Finish: Fluoropolymer coating, finished after fabrication.
 - 6. Color: As selected from manufacturer's standard colors.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M).
- B. Bird Screen: Interwoven wire mesh of steel, 0.063 inch diameter wire, 1/2 inch open weave, diagonal design.
- C. Insect Screen: 18 x 16 size aluminum mesh.
- D. Polyvinylidene Fluoride Coating: Minimum 70 percent Kynar 500/Hylar 500 resin, two coat finish, complying with AAMA 2604.

2.04 ACCESSORIES

- A. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- B. Fasteners and Anchors: Galvanized steel.
- C. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb.
- C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- D. Secure louver frames in openings with concealed fasteners.

3.03 CLEANING

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

END OF SECTION

SECTION 10350

FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum Flagpoles.

1.02 REFERENCES

- A. AASHTO M 36M - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; American Association of State Highway and Transportation Officials; 2001.
- B. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2002.

1.03 PERFORMANCE REQUIREMENTS

- A. Flagpole With Flag Flying: Resistant without permanent deformation to 90 miles/hr wind velocity; nonsafety design factor of 2.5.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pole, accessories, and configurations.
- C. Shop Drawings: Indicate detailed dimensions, attachment details, anchor requirements, and imposed loads.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
- B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Flagpoles:
 - 1. American Flagpole: www.americanflagpole.com.
 - 2. Concord Industries, Inc: www.flagpoles.com.
 - 3. Pole-Tech Co., Inc: www.poletech.com.
 - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 FLAGPOLES

- A. Flagpole: Aluminum.
 - 1. Nominal Height: 30 ft; measured from nominal ground elevation.
 - 2. Mounting: Ground mounted type.
 - 3. Design: One piece seamless 6063-T6 aluminum extrusion. Cone tapered.
 - 4. Halyard: External type.

2.03 POLE MATERIALS

- A. Aluminum: ASTM B221 (ASTM B 221M), 6063 alloy, T6 temper.

2.04 ACCESSORIES

- A. Finial Ball: Aluminum, 6 inch diameter.

- B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.
- C. Cleats: 9 inch size, aluminum with stainless steel fastenings, one per halyard.
- D. Halyard: 5/16 inch diameter polypropylene, braided, white.
- E. Flagsnaps: bronze, for two flags.

2.05 MOUNTING COMPONENTS

- A. Foundation Tube Sleeve: AASHTO M 36M, corrugated 16 gage steel, galvanized, depth of 36 inches, as indicated.
- B. Pole Base Attachment: Flush; aluminum base with base cover.
- C. Lightning Ground Rod: 48 inch long copper rod, 3/4 inch diameter.
- D. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.06 FINISHING

- A. Metal Surfaces in Contact With Concrete: Asphaltic paint.
- B. Aluminum: Anodized to AAM 32-C22-A41, clear color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

- A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

- A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.
- B. Electrically ground flagpole installation.
- C. Fill foundation tube sleeve with concrete specified in Section 03300.
- D. Install foundation plate and centering wedges for flagpoles base set in concrete base and fasten.

3.04 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

- A. Adjust operating devices so that halyard function smoothly.

END OF SECTION

SECTION 10441

PLASTIC SIGNS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Injection molded signs.

1.02 RELATED SECTIONS

- A. Section 15075 - Mechanical Identification.
- B. Section 16075 - Electrical Identification.

1.03 REFERENCES

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate sign styles, lettering font, foreground and background colors, locations, overall dimensions of each sign.
- C. Samples: Submit two sample signs, 6x6 inch in size illustrating type, style, letter font, and colors specified; method of attachment.
- D. Manufacturer's Installation Instructions: Include installation template and attachment devices.

1.05 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plastic Signs:
 - 1. Advance Printing Products, Inc.
 - 2. Best Manufacturing Co: www.bestsigns.com.
 - 3. Mohawk Sign Systems, Inc: www.mohawksign.com.
 - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 INJECTION MOLDED SIGNS

- A. Base Material: Acrylic plastic.
 - 1. Comply with applicable provisions of ANSI/ICC A117.1, including Braille.
 - 2. Sign Color: Color as selected.
 - 3. Character Color: Contrasting as selected color.
 - 4. Total Thickness: 1/8 inch.
 - 5. Size: 6 inches wide x 8 inches high or as required.
 - 6. Edges: Radiused
 - 7. Character Font: Helvetica.
- B. Graphics:
 - 1. As shown on the drawings.
- C. Frame:
 - 1. Match color of sign.

2.03 ACCESSORIES

- A. Mounting Hardware: Tapcon screws for mounting frame to masonry.
- B. Tape Adhesive: Double sided tape, permanent adhesive for mounting sign to frame.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and as called for herein.
- B. Install signs after surfaces are finished, in locations scheduled.
- C. Position signs as indicated on drawings.

END OF SECTION

SECTION 10523

FIRE EXTINGUISHERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 REFERENCES

- A. NFPA 10 - Standard for Portable Fire Extinguishers; National Fire Protection Association; 2002.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.03 PERFORMANCE REQUIREMENTS

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate cabinet physical dimensions.
- C. Product Data: Provide extinguisher operational features.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers, Cabinets and Accessories:
 - 1. JL Industries, Inc: www.jlindustries.com.
 - 2. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 3. Potter-Roemer: www.potterroemer.com.
 - 4. Substitutions: See Section 01600 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Dry Chemical Type: Cast steel tank, with pressure gage.
 - 1. Class A:B:C.
 - 2. Size 2A:10B:C.
 - 3. Finish: Baked enamel, red color.

2.03 FIRE EXTINGUISHER CABINETS

- A. Location: For extinguishers in living spaces.
- B. Metal: Formed primed steel sheet; 0.036 inch thick base metal.
- C. Cabinet Configuration: Semi-recessed type.
 - 1. Trim: Returned to wall surface, with 1/2 inch projection, 1 inch wide face.

2. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
- D. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon catch.
- E. Door Glazing: Plastic, clear, 1/16 inch thick acrylic. Set in resilient channel gasket glazing.
- F. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
- G. Weld, fill, and grind components smooth.
- H. Finish of Cabinet Exterior Trim and Door: Red baked enamel.
- I. Finish of Cabinet Interior: White enamel.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
 1. Location: For extinguishers in apparatus bay.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 48 inches from finished floor to top of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets and on wall brackets at appropriate locations.

END OF SECTION

SECTION 10800

TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Accessories for toilet rooms, showers, and utility rooms.

1.02 RELATED SECTIONS

- A. Section 06114 - Wood Blocking and Curbing: Placement of reinforcement for backing plate reinforcement and accessories mounting.
- B. Section 09300 - Tile: Ceramic washroom accessories.

1.03 REFERENCES

- A. ASTM A 269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2002a.
- B. ASTM C 1036 - Standard Specification for Flat Glass; 2001.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

1.05 COORDINATION

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products listed are made by Bobrick, for minimum quality level accepted.
- B. Other Acceptable Manufacturers:
 - 1. American Specialties, Inc: www.americanspecialties.com.
 - 2. Bradley Corporation: www.bradleycorp.com.
 - 3. Substitutions: Section 01600 - Product Requirements.
- C. All items of each type to be made by the same manufacturer.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Provide 4 keys for each accessory to Owner.
- C. Stainless Steel Sheet: ASTM A 666, Type 304.
- D. Stainless Steel Tubing: ASTM A 269, Type 304 or 316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M, with G90/Z275 coating.
- F. Mirror Glass: Float glass, ASTM C 1036 Type I, Class 1, Quality Q2, with silvering, copper

coating, and suitable protective organic coating to copper backing in accordance with GSA CID A-A-3002.

- G. Adhesive: Two component epoxy type, waterproof.
- H. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

2.03 FINISHES

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 TOILET ROOM ACCESSORIES

- A. See schedule on drawings.
- B. Mirrors: Stainless steel framed, 6 mm thick tempered glass mirror.
 - 1. Size: As indicated on drawings.
 - 2. Frame: 3/4 x 3/4 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
 - 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
 - 4. Mount with fully concealed, galvanized steel wall hanger(s) and locking screws.
 - 5. Product: B - 290 Series (standrd & special order size) manufactured by Bobrick
 - 6. Product (accessible toilet rooms and stalls): B - 293 Tilt Mirror manufactured by Bobrick.
- C. Grab Bars: Stainless steel, 1-1/2 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
 - 1. Length and configuration: As indicated on drawings and to meet state and federal ADA requirements.
 - 2. Product: B - 6806.99 Series manufactured by Bobrick

2.05 SHOWER AND TUB ACCESSORIES

- A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for concealed mounting.
- B. Shower Curtain: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 1. Size: 72 x 72 inches, hemmed edges.
 - 2. Shower curtain hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

2.06 UTILITY ROOM ACCESSORIES

- A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
 - 1. Holders: 4 spring-loaded rubber cam holders.
 - 2. Length: 36 inches minimum.
 - 3. Product: B - 223 x 36 manufactured by Bobrick.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions except use toggle bolts or Tapcon fasteners to masonry.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

END OF SECTION

SECTION 11450

RESIDENTIAL EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen appliances.

1.02 RELATED SECTIONS

- A. Section 15815 - Ductwork: Exhaust ductwork.
- B. Section 16155 - Equipment Wiring: Electrical connections for appliances.

1.03 REFERENCES

- A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Whirlpool Corp and Frigidaire: www.whirlpool.com. & www.frigidaire.com.
- B. Substitutions: Section 01600 – Product Requirements.
- C. Whirlpool Corp. and Frigidaire are the referred manufacturers for purposes of quality assurances only, and is not considered proprietary.

2.02 KITCHEN APPLIANCES

- A. Frigidaire Range: Model FEF368GC Stainless Steel
- B. Frigidaire Dishwasher: Model FDB1100RHC Stainless Steel
- C. Whirlpool Refrigerators: Model G21XEFMWS Stainless Steel
- D. Ice Maker – HOSH12AK1 Model KML-451MAH cube style air cooled with B-500 SF ice bin.

2.03 COOKING EXHAUST

- A. Cooking Exhaust: Range hood; Broan 30" Stainless Steel 7" Round Ducted Model No. 423004.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

- C. Coordinate with installation of extinguisher system. Refer to Mechanical Drawings.

3.03 ADJUSTING

- A. Adjust operating equipment to efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment.
- B. Wash and clean equipment.

END OF SECTION

SECTION 12356

COMMERCIAL CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Casework furnishings.

1.02 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Wood blocking in walls for attachment.

1.03 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a protected manner inside.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Storage Cabinets & Shelving: Hallowell: www.hallowell-list.com.
- B. Bunker Gear Lockers: Groves Inc.: 1.800.852.6088, Ready Rack "Red Rack" wall mounted bunker gear lockers, thefirestore.com.

2.02 CASEWORK (listed as keyed on drawings)

- A. 1108: Storage cabinet 4 shelves, 36x18x78H, Model 515833.
- B. 1109: Metal shelving open, 7 shelves, 48x18x74H, Model 510952.
- C. 1103: Wall mounted Bunker Gear Lockers: 20" x 20" x 72" high. Wall mounted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that finish conditions are ready to receive case goods for installation.
- B. Environmental equipment shall have been operating, and case goods shall have acclimated at least 36 hours prior to installation.

3.02 INSTALLATION

- A. All steel storage cabinets and steel shelving shall be set on rubber mat, leveled and secured to solid blocking in walls.

3.03 INTERFACE WITH OTHER WORK

- A. All wall and floor finishes shall be installed prior to installation of case goods.

3.04 CLEANING

- A. Clean all interior and exterior surfaces.
- B. Protect installed case goods from damage.

END OF SECTION

SECTION 12493

HORIZONTAL BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Horizontal blinds.
- B. Operating hardware.

1.02 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating physical and dimensional characteristics.
- C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.
- D. Samples: Submit two samples, 2 inch long illustrating slat materials and finish, color, cord type and color.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 5 years documented experience.
- B. Provide 10 year headrail warranty from manufacturer.

1.04 PROJECT CONDITIONS

- A. Coordinate the work with window installation and placement of concealed blocking to support blinds.
- B. Take field measurements to determine sizes required.

1.05 EXTRA MATERIALS

- A. See Section 01600 - Product Requirements, for additional provisions.
- B. Provide 10 additional slats.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Blinds:
 - 1. Springs Window Fashions Division, Inc: www.springs.com.
 - a. Graber; Product Classic Supreme 1" aluminum blinds.
 - 2. Substitutions: See Section 01600 - Product Requirements.

2.02 BLINDS AND BLIND COMPONENTS

- A. Blinds: Horizontal louvers hung from full length light blocking head rail, clutch wand tilter, hidden bracket system.
- B. Louvers: 6 gage, 1" wide.
- C. Color: Selected by Architect from manufacturers standard palette.
- D. Headrail Attachment: Appropriate for finished opening conditions.

- E. Accessory Hardware: Type recommended by blind manufacturer.

2.03 FABRICATION

- A. Fabricate blinds to fit within openings with uniform edge clearance of 1/8 inch.
- B. Fabricate blinds to cover window frames completely.
- C. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/2 inch between blinds, located at window mullion centers.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings are ready to receive the work.
- B. Ensure structural blocking and supports are correctly placed.

3.02 INSTALLATION

- A. Install blinds in accordance with manufacturer's instructions.
- B. Secure in place with concealed fasteners.
 - 1. Use Tapcon fasteners for masonry substrate.
- C. Place intermediate head supports at 24 inch on center.

3.03 INSTALLATION TOLERANCES

- A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.
- B. Maximum Offset From Level: 1/8 inch.

3.04 ADJUSTING

- A. Adjust blinds for smooth operation.

3.05 CLEANING

- A. Clean blind surfaces just prior to occupancy.

END OF SECTION

SECTION 12700

SYSTEMS FURNITURE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Section includes installation of systems furniture.
- B. Work includes, but is not limited to, the following:
 - 1. Labor, equipment, and material to install systems furniture.
 - 2. Labor, equipment, and material to:
 - a. Protect and transport components from Vendor's warehouse or other locations.

1.02 RELATED SECTIONS

- A. Section 01400-QUALITY REQUIREMENTS

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ADA (Americans with Disabilities Act) Guidelines

1.04 DEFINITIONS

Systems Furniture: Assembly of furniture, partitions, lighting, cabling, and wiring.

1.05 SUBMITTALS

- A. 12" x 12" samples of all fabric finishes in specified grade.
- B. Metal Finish Samples: Provide samples where metal has been painted in same manner as final product.
- C. Shop Drawings: Include plans, elevations, details and attachment to other work. Show materials, finishes and hardware.

1.06 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide fabric-covered panels with the following surface-burning characteristics as determined by testing identical products per ASTM E84 by UL, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.

1.07 WARRANTY

- A. Provide "Lifetime Warranty" as outlined in Alsteel's Warranty information. Warranty to cover any defects in material and workmanship for as long as the original purchaser owns them.

1.08 COORDINATION

- A. Contractor shall ensure proper backing/deadwood is installed in all walls receiving systems furnishings.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. New Installations:

Allsteel: provide Allsteel Concensys wall mounted panel and necessary components for a complete installation.

1. Panel: Model #904348

a. Fabric: Grade A – color selected by Architect from manufacturers full range.

b. Metal: Selected by Architect from manufacturers full range.

2. Wall Mount Bracket: Model #802543P

3. Panel End Cover: Model #801843P

2.02 ANCHORS AND ATTACHMENT DEVICES

A. Fasteners and Anchors: Approved by manufacturer for use in intended application to support fully-loaded partition components.

B. Do not use wood plugs, lead wool, lead lag-screw shields, or plastic threaded shields.

2.03 TOUCH-UP MATERIAL

A. Touch-up material: Manufacturer's recommended product.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine floors and conditions for compliance with requirements, installation tolerances, and other conditions affecting performance of systems furniture. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect existing work.

B. Cleaning: Before installing systems furniture, vacuum floor and remove dust, dirt, and debris.

3.03 INSTALLATION

A. General: Install systems furniture in accordance with manufacturer's installation instructions, requirements of this specification, ADA and Contract Drawings.

1. Allsteel: Allsteel Concensys Systems Furniture, Specification Guide.

B. Coordinate with work of other trades that are affected by systems furniture installation.

1. Install systems furniture after floor coverings and suspended acoustical ceilings have been installed.

C. Install panel runs level, plumb, and straight with perpendicular intersections.

D. Install panels level with integral, concealed adjustable devices with not more than ¼ inch between panel base and finish floor. Do not use shims. Install vertical and horizontal panel joints flush.

E. Adjust panel components and hardware, insuring that proper rigidity and balance are maintained.

- F. Furnish and install anchoring devices as required, and secure panels to walls using concealed fasteners.
 - 1. Attach partition components to existing building components with anchors approved for the application as recommended by manufacturer.
- G. Keep furniture assembly areas and egress paths clear of boxes, parts and debris. Do not block building exits or exiting corridors. Remove trash daily to avoid trip hazards and fire potential.
- H. Protect all existing site landscaping, building wall finishes and flooring from damage during the furniture installation. The furniture installation Contractor shall repair or replace, at their cost, damage to property during the furniture installation.

3.04 REPAIR

- A. Repair damaged or defaced work, or replace with new work as acceptable to architect at no charge to the County.
 - 1. Panels or system furniture parts that are damaged by Contractor shall be repaired, or replaced at Contractor's expense.
 - 2. Repairs shall comply with requirements of Quality Assurance Article.

END OF SECTION

SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

1.01 GENERAL

A. Definitions include the following:

1. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
2. Exposed, Interior Installations: Exposed to view indoors.
3. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions.
4. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants.
5. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures.

B. The following are industry abbreviations for plastic and rubber materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. NP: Nylon plastic.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.
6. CR: Chlorosulfonated polyethylene synthetic rubber.
7. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. Submit the following:

1. Coordination Drawings of major elements, components, and systems of mechanical equipment.

D. Equipment selection of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.02 PRODUCTS

A. Refer to individual Division 15 piping Sections for pipe and fitting materials and joining methods and for special joining materials not listed below.

1. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, suitable for chemical and thermal conditions of piping system contents, and 1/8-inch (3.2-mm) maximum thickness. Include full-face type for flat-face flanges, narrow-face type for raised-face flanges, and carbon-steel bolts and nuts.

2. Solder Filler Metal: ASTM B 32, Alloy Sn95, Alloy Sn94, or Alloy Sb5, unless otherwise indicated.
 3. Brazing Filler Metals: AWS A5.8, BCuP Series or Alloy BAg1, unless otherwise indicated.
 4. Welding Filler Metals: Comply with AWS D10.12.
 5. Solvent Cements: ASTM D 2235 for ABS piping, ASTM F 493 for CPVC piping, and ASTM D 2564 with ASTM F 656 primer for PVC piping.
- B. Dielectric Fittings: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types matching piping system materials; with insulating material suitable for system fluid, pressure, and temperature.
1. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
 2. Dielectric Couplings: Galvanized-steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
- C. Flexible Connectors: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig (860-kPa) minimum working-pressure rating, threaded ends for 2-inch NPS (DN50) and smaller, and flanged ends for 2-1/2-inch NPS (DN65) and larger.
1. Bronze-Hose Type: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.
 2. Stainless-Steel-Hose/Steel Pipe Type: Corrugated, stainless steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.
 3. Rubber, Flexible Connectors: CR or EPDM elastomer rubber construction, with multiple plies of NP fabric, molded and cured in hydraulic presses. Include 125-psig (860-kPa) minimum working-pressure rating at 220 deg F (104 deg C).
- D. Mechanical Sleeve Seals: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.
- E. Steel, Sheet-Metal Sleeves: 0.0239-inch (0.6-mm) minimum thickness, galvanized, round tube closed with welded longitudinal joint.
- F. Steel Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
- G. Cast-Iron Wall Pipe: Cast or fabricated, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.
- H. PVC Sleeves: Manufactured, permanent, with nailing flange for attaching to wooden forms.
- I. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
- J. PE Sleeves: Manufactured, reusable, tapered, cup shaped, smooth outer surface, with nailing flange for attaching to wooden forms.
- K. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves. Include ID to closely fit around pipe, tube, and insulation of insulated piping and OD to completely cover opening.

1. Cast Brass: One-piece or split casting, with concealed hinge; set screw; and polished chrome-plated finish.

L. Identifying Devices and Labels: Manufacturer's standard products.

1. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment in accessible and visible location. Include manufacturer, product name, model number, serial number, capacity, operating and power characteristics, and labels of tested compliances. Painted or inked letters are not permitted.
2. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semi-rigid, snap on, color-coded, complying with ASME A13.1.
3. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.
4. Plastic Equipment Markers: Color-coded, laminated plastic. Include green for cooling equipment; yellow for heating equipment; yellow/green or green for combination cooling and heating equipment; brown for energy reclamation equipment; blue for other equipment; and as recommended by ASME A13.1 for hazardous equipment. Include name and plan number, service, design capacity, design parameters, and size approximate 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; and 4-1/2 by 6 inches (115 by 150 mm) for equipment.
5. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

- M. Grout: ASTM C 1107, Grade B, non-shrink and nonmetallic, premixed and factory packaged; and 5000-psi (34.5-MPa), 28-day compressive strength design mix.

1.03 EXECUTION

- A. Piping Systems - Common Requirements: Install piping as described below, unless piping Sections specify otherwise. Division 15 piping Sections specify unique installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install components with pressure rating equal to or greater than system operating pressure.
- D. Install piping in concealed locations, except in equipment rooms and service areas.
- E. Install exposed piping at right angles or parallel to building walls.
- F. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- G. Install piping to allow application of insulation plus 1-inch (25-mm) clearance around insulation.
- H. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

- I. Install fittings for changes in direction and branch connections.
- J. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces, except extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor.
 - 2. Install sleeves large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. PVC or Steel Pipe Sleeves: For pipes smaller than 6-inch NPS (DN150), unless otherwise indicated.
 - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS (DN150) and larger, penetrating gypsum-board partitions.
 - 3. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 for materials. Use Type S, Grade NS, Class 25, Use O neutral-curing silicone sealant, unless otherwise indicated.
 - 4. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals. Assemble and install mechanical sleeve seals according to manufacturer's written instructions.
 - 5. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron wall pipes. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals. Assemble and install mechanical sleeve seals according to manufacturer's written instructions.
- K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with code approved firestopping materials.
- L. Verify final equipment locations for roughing-in. Refer to other Sections of these Specifications for roughing-in requirements.
- M. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections. Ream ends of pipes and tubes and remove burrs; bevel plain ends of steel pipe; and remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly. Construct soldered joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube" or CDA's "Copper Tube Handbook"; brazed joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube"; threaded joints according to ASME B1.20.1; and welded joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe."
 - 1. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
 - 2. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Comply with ASTM F 402 for safe handling practice of cleaners, primers, and solvent cements, and join ABS piping according to ASTM D 2235 and ASTM D 2661, CPVC piping according to ASTM D 2846 and ASTM F 493, PVC pressure piping according to ASTM D 2672, and PVC non-pressure piping according to ASTM D 2855.

- N. Piping Connections: Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.
 2. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 3. Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
- O. Painting and Finishing: Refer to Division 9 for paint materials, surface preparation, and application of paint. Apply semi-gloss, acrylic-enamel finish to exposed piping according to the following:
1. Interior, Ferrous Piping and Ferrous Supports: Finish coat over enamel undercoat and primer.
 2. Exterior, Ferrous Piping and Ferrous Supports: Two finish coats over rust-inhibitive metal primer.
 3. Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
- P. Concrete Bases: Construct concrete equipment bases of dimensions indicated, but not less than 4 inches (100 mm) larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3.
- Q. Erection of Metal Supports and Anchorage: Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment. Comply with AWS D1.1, "Structural Welding Code--Steel," for welding.
- R. Cutting and Patching: Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved. Repair cut surfaces to match adjacent surfaces.
- S. Grouting: Install nonmetallic non-shrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

END OF SECTION

SECTION 15060

HANGERS AND SUPPORTS

1.01 GENERAL

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.02 PRODUCTS

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components.
 - 1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
 - 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
 - 1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
 - 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) minimum compressive-strength insulation, encased in sheet metal shield.
 - 1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
 - 2. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
 - 3. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
 - 4. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
 - 5. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.
- D. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- E. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- F. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- G. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.

1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
2. Properties: Nonstaining, noncorrosive, and nongaseous.
3. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

1.03 EXECUTION

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN15 to DN750).
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN100 to DN400), requiring up to 4 inches (100 mm) of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN20 to DN600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 4. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN15 to DN200).
 5. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30 (DN15 to DN750).
 6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN100 to DN900), with steel pipe base stanchion support and cast-iron floor flange.
- D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN20 to DN500)
- E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
- F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (675 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1350 kg).

3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi (690-kPa) minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.
- H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
- I. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- J. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.
- K. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes. Support pipes of various sizes together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- L. Install building attachments within concrete slabs or attach to structure. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- M. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
- N. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- O. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- P. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

- Q. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- R. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- S. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - b. Do not exceed pipe stress limits according to ASME B31.9.
 - 2. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
 - 3. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN8 to DN90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - c. NPS 5 and NPS 6 (DN125 and DN150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
 - 4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
- T. Equipment Supports: Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor. Place grout under supports for equipment and make smooth bearing surface.
- U. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with 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. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.
- V. Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- W. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- X. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 15081

DUCT INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.
- B. Related Sections include the following:
 - 1. Division 15 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
 - 2. Division 15 Section "Refrigerant Piping" for insulation for piping systems.
 - 3. Division 15 Section "Metal Ducts" for duct liner.

1.03 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for the following:
 - 1. Removable insulation sections at access panels.
 - 2. Application of field-applied jackets.
 - 3. Applications at linkages for control devices.
- C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
- D. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

- 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
- 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.06 COORDINATION

- A. Coordinate clearance requirements with duct Installer for insulation application.

1.07 SCHEDULING

- A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mineral-Fiber Insulation:
 - a. CertainTeed Manson.
 - b. Knauf FiberGlass GmbH.
 - c. Owens-Corning Fiberglas Corp.
 - d. Johns-Manville, Inc.

2.02 INSULATION MATERIALS

- A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

2.03 FIELD-APPLIED JACKETS

- A. General: ASTM C 921, Type 1, unless otherwise indicated.
- B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

2.04 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
 - 1. Tape Width: 4 inches (100 mm).
- B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
 - 1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch (0.5 mm) thick.
 - 2. Galvanized Steel: 0.005 inch (0.13 mm) thick.
 - 3. Aluminum: 0.007 inch (0.18 mm) thick.
 - 4. Brass: 0.010 inch (0.25 mm) thick.
 - 5. Nickel-Copper Alloy: 0.005 inch (0.13 mm) thick.
- C. Wire: 0.080-inch (2.0-mm), nickel-copper alloy; 0.062-inch (1.6-mm), soft-annealed, stainless steel; or 0.062-inch (1.6-mm), soft-annealed, galvanized steel.
- D. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.
 - 1. Welded Pin Holding Capacity: 100 lb (45 kg) for direct pull perpendicular to the attached surface.
- E. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.
 - 1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb (45 kg) for direct pull perpendicular to the adhered surface.

- F. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.05 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.03 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply multiple layers of insulation with longitudinal and end seams staggered.
- E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- F. Keep insulation materials dry during application and finishing.
- G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- H. Apply insulation with the least number of joints practical.

- I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
- J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
- K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- L. Apply insulation with integral jackets as follows:
 - 1. Pull jacket tight and smooth.
 - 2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
 - 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.
 - 1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
 - 2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.
- O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- P. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.
- Q. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.
 - 1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.04 MINERAL-FIBER INSULATION APPLICATION

- A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

- a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
 - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 4. Impale insulation over anchors and attach speed washers.
 5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.
 7. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches (450 mm) o.c.
 8. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.
 10. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.
- B. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.
1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Space anchor pins as follows:
 - a. On duct sides with dimensions 18 inches (450 mm) and smaller, along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
 - b. On duct sides with dimensions larger than 18 inches (450 mm). Space 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
 - c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch (13-mm) staples, 1 inch (25 mm) o.c., and cover with pressure-sensitive tape having same facing as insulation.
6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- (150-mm-) wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches (150 mm) o.c.
8. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.05 FINISHES

- A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 9 Section "Painting."
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.06 DUCT SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
- C. Insulate the following plenums and duct systems:
 1. Indoor concealed supply-, return-, and outside-air ductwork.
 2. Indoor exposed supply-air ductwork, between inner and outer duct wall.
- D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 1. Factory-insulated flexible ducts.
 2. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 3. Vibration-control devices.
 4. Access panels and doors in air-distribution systems.

3.07 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

- A. Service: Round, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

B. Service: Round, return-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

C. Service: Rectangular, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

D. Service: Rectangular, return-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2 inches (50 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

E. Service: Rectangular, supply, return, and outside-air ducts, exposed in mechanical room.

1. Material: Semi-rigid mineral-fiber board.
2. Thickness: 1-1/2 inches (38 mm).
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

END OF SECTION

SECTION 15083

PIPE INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.
- B. Related Sections include the following:
 - 1. Division 15 Section "Duct Insulation" for insulation for ducts and plenums.
 - 2. Division 15 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.03 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.06 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."
- B. Coordinate clearance requirements with piping Installer for insulation application.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mineral-Fiber Insulation:
 - a. CertainTeed Manson.
 - b. Knauf FiberGlass GmbH.
 - c. Owens-Corning Fiberglas Corp.
 - d. Schuller International, Inc.
 - 2. Flexible Elastomeric Thermal Insulation:
 - a. Armstrong World Industries, Inc.
 - b. Rubatex Corp.

2.02 INSULATION MATERIALS

- A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
 - 1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
 - 2. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
 - a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
 - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
 - 3. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
 - 4. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
- B. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - 1. Adhesive: As recommended by insulation material manufacturer.

2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
- C. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.03 FIELD-APPLIED JACKETS

- A. General: ASTM C 921, Type 1, unless otherwise indicated.
- B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
- C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils (0.5 mm) thick; roll stock ready for shop or field cutting and forming.
 1. Adhesive: As recommended by insulation material manufacturer.
 2. PVC Jacket Color: White or gray.
 3. PVC Jacket Color: Color-code piping jackets based on materials contained within the piping system.
- D. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- (0.5-mm-) thick, high-impact, ultraviolet-resistant PVC.
 1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
 2. Adhesive: As recommended by insulation material manufacturer.

2.04 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd. (270 g/sq. m).
 1. Tape Width: 4 inches (100 mm).
- B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
 1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch (0.5 mm) thick.
 2. Galvanized Steel: 0.005 inch (0.13 mm) thick.
 3. Aluminum: 0.007 inch (0.18 mm) thick.
 4. Brass: 0.010 inch (0.25 mm) thick.
 5. Nickel-Copper Alloy: 0.005 inch (0.13 mm) thick.

2.05 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.03 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.
- E. Apply multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- H. Keep insulation materials dry during application and finishing.
- I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- J. Apply insulation with the least number of joints practical.
- K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.
- L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
 - 1. Apply insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
 3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- M. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- O. Apply insulation with integral jackets as follows:
1. Pull jacket tight and smooth.
 2. Circumferential Joints: Cover with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches (100 mm) o.c.
 3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches (40 mm). Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.
 - a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.
 4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.
- P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.
- Q. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.
- R. Floor Penetrations: Apply insulation continuously through floor assembly.
1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.
- 3.04 MINERAL-FIBER INSULATION APPLICATION
- A. Apply insulation to straight pipes and tubes as follows:
1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.

2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet (4.5 to 6 m) to form a vapor retarder between pipe insulation segments.
3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch (25 mm), and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. Cover fittings with standard PVC fitting covers.
4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
3. Apply insulation to flanges as specified for flange insulation application.
4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
6. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.05 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.

2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.
2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.
3. Apply insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.06 FIELD-APPLIED JACKET APPLICATION

A. Apply insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.
2. Apply lap or joint strips with the same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Apply jackets with 1-1/2-inch (40-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. Apply PVC jacket where indicated, with 1-inch (25-mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

3.07 FINISHES

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of the insulation manufacturer's recommended protective coating.
- B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.08 PIPING SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 - 1. Flexible connectors.
 - 2. Vibration-control devices.
 - 3. Fire-suppression piping.
 - 4. Drainage piping located in crawl spaces, unless otherwise indicated.
 - 5. Below-grade piping, unless otherwise indicated.
 - 6. Chrome-plated pipes and fittings, unless potential for personnel injury.
 - 7. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.09 FIELD QUALITY CONTROL

- A. Inspection: Perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:
 - 1. Inspect fittings and valves randomly selected by Architect.
 - 2. Remove fitting covers from 20 elbows or 1 percent of elbows, whichever is less, for various pipe sizes.
 - 3. Remove fitting covers from 20 valves or 1 percent of valves, whichever is less, for various pipe sizes.
- B. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.
- C. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

3.010 INSULATION APPLICATION SCHEDULE, GENERAL

- A. Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.
- B. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements.

3.011 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic hot water.

1. Operating Temperature: 60 to 140 deg F (15 to 60 deg C).
2. Insulation Material: Flexible elastomeric or mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses:
 - a. Copper Pipe, 3/4" thick flexible elastomeric.
 - b. Copper Pipe, 1" thick mineral fiber.
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: No.
6. Finish: None.

B. Service: Condensate drain piping.

1. Operating Temperature: 35 to 75 deg F (2 to 24 deg C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 3/4" thick
4. Field-Applied Jacket: None.
5. Vapor Retarder Required: Yes.
6. Finish: None.

C. Service: Refrigerant suction and hot-gas piping.

1. Operating Temperature: 35 to 50 deg F (2 to 10 deg C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: Apply the following insulation thicknesses:
 - a. Copper pipe, 1/2" to 4" pipe size, 3/4" thick
4. Field-Applied Jacket: PVC.
5. Vapor Retarder Required: Yes.
6. Finish: None

3.012 EXTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Refrigerant suction.

1. Operating Temperature: 35 to 50 deg F (2 to 10 deg C).
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: Apply the following insulation thicknesses:
 - a. Copper pipe, 1/2" to 4" pipe size, 3/4" thick
4. Field-Applied Jacket: UV resistant PVC.
5. Vapor Retarder Required: Yes.
6. Finish: Painted where exposed to UV light. Color to match equipment

END OF SECTION

SECTION 15110

VALVES

1.01 GENERAL

- A. ASME Compliance: ASME B31.9 for building services piping valves except domestic hot- and cold-water piping.
- B. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.02 PRODUCTS

- A. Refer to valve application paragraphs for applications of valves.
- B. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.
- C. Valve Actuators: Handwheel for valves other than quarter-turn types and lever handle for quarter-turn valves.
- D. Copper-Alloy Ball Valves, General: MSS SP-110.
 - 1. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and [600-psig (4140-kPa)] minimum CWP rating and blowout-proof stem.
- E. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.
 - 1. Class 125, Bronze Gate Valves: Bronze body with non-rising stem and bronze solid wedge.

1.03 EXECUTION

- A. Valve Applications: Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball or gate valves.
 - 2. Throttling Service: Ball or globe valves.
 - 3. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- B. Domestic Water Piping: Use the following types of valves:
 - 1. Ball Valves: Two-piece, 400-psig (2760-kPa) CWP rating, copper alloy.
 - 2. Gate Valves, NPS 2 (DN 50) and Smaller: Class 125, bronze.
- C. Select valves with the following end connections:
 - 1. For Copper Tubing: Solder-joint or threaded ends

D. Valve Installation:

1. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
2. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
3. Locate valves for easy access and provide separate support where necessary.
4. Install valves in horizontal piping with stem at or above center of pipe.
5. Install valves in position to allow full stem movement.
6. Install check valves for proper direction of flow and swing check valves in horizontal position with hinge pin level.

E. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

F. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION

SECTION 15140

DOMESTIC WATER PIPING

1.01 GENERAL

- A. Performance Requirements: Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Service Piping: 200 psig (1380 kPa).
 - 2. Domestic Water Distribution Piping: 160 psig (1100 kPa).
- B. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

1.02 PRODUCTS

- A. Piping Materials: Refer to "Piping Applications" Paragraph for applications of pipe, tube, fitting, and joining materials.
 - 1. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
 - 2. Transition Couplings for Underground Pressure Piping: AWWA C219, metal, sleeve-type coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
 - 3. Soft Copper Tube: ASTM B 88, Types K (ASTM B 88M, Type A), water tube, annealed temper.
 - a. Copper Pressure Fittings: ASME B16.22, wrought-copper, solder-joint fittings.
 - b. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end.
 - c. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
 - 4. Hard Copper Tube: ASTM B 88, Types L (ASTM B 88M, Type B), water tube, drawn temper.
 - a. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - b. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end.
 - c. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

1.03 EXECUTION

- A. Refer to Division 2 for excavating, trenching, and backfilling.
- B. Piping Applications:

1. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
 2. Flanges may be used on aboveground piping, unless otherwise indicated.
 3. Underground Domestic Water Service Piping: Use the following piping materials for each size range:
 - a. NPS 2 (DN 50) and Smaller, below grade: Soft copper tube, Type K (Type A); copper pressure fittings; and soldered joints.
 4. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
 - a. Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.
- C. Valve Applications: Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use bronze ball or gate valves.
 2. Throttling Duty: Use bronze ball valves for piping NPS 2 (DN 50) and smaller.
 3. Drain Duty: Hose-end drain valves.
- D. Piping Installation: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.
1. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.
 2. Install underground copper tubing according to CDA's "Copper Tube Handbook."
 3. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service 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.
 4. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.
 5. Install shutoff valve and hose-end drain valve inside building at each domestic water service.
 6. Install aboveground domestic water piping level without pitch and plumb.
 7. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- E. Perform the following steps before 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 filter cartridges from housings, and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.
- F. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

- G. Joint Construction: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
 - 1. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- H. Valve Installation:
 - 1. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball or gate valves for piping NPS 2 (DN 50) and smaller.
 - 2. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
 - 3. Install hose-end drain valves at low points in water mains, risers, and branches.
- I. Hanger and Support Installation: Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- J. Install supports according to Division 15 Section "Hangers and Supports."
 - 1. Support vertical piping and tubing at base and at each floor.
 - 2. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8-inch (10 mm).
- K. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
 - 3. NPS 1-1/2 and greater (DN 40 and greater): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
- L. Install supports for vertical copper tubing every 10 feet (3 m).
- M. Connections: Drawings indicate general arrangement of piping, fittings, and specialties.
 - 1. Install piping adjacent to equipment and machines to allow service and maintenance.
 - 2. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
 - 3. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:

- a. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
- b. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
- c. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

N. Field Quality Control:

1. Inspect domestic water piping as follows:
 - a. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
 - b. 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:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2) Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
2. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
3. Test domestic water piping as follows:
 - a. 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.
 - b. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - c. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - d. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.

O. Clean and disinfect domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures 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 (50 mg/L) 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 (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- P. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 15150

SANITARY WASTE AND VENT PIPING

1.01 GENERAL

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

1.02 PRODUCTS

- A. Piping Materials: Refer to "Piping Applications" Paragraph for applications of pipe, tube, fitting, and joining materials.
 - 1. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
 - a. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns.

1.03 EXECUTION

- A. Refer to Division 2 for excavating, trenching, and backfilling.
- B. Piping Applications:
 - 1. Aboveground Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
 - a. NPS 2 to NPS 6 (DN 50 to DN 150): PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Underground Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
 - a. NPS 2 to NPS 6 (DN 50 to DN 150): PVC pipe, PVC socket fittings, and solvent-cemented joints.
- C. Piping Installation: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
 - 2. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service 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.

3. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.
 4. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
 5. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- D. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack
- E. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- F. Install underground PVC soil and waste drainage piping according to ASTM D 2321.
- G. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- H. Joint Construction: Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
1. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.
- I. Install supports according to Division 15 Section "Hangers and Supports."
1. Support vertical piping and tubing at base and at each floor.
 2. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
 3. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - a. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
 - b. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
 - c. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
 4. Install supports for vertical PVC piping every 48 inches (1200 mm).

- J. Connections: Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."
 4. Equipment: Connect drainage piping as indicated.
- K. Field Quality Control:
1. 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.
 2. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 3. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - a. 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.
 - b. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - c. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - d. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 - e. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
- L. Clean interior of piping. Remove dirt and debris as work progresses. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work. Place plugs in ends of uncompleted piping at end of day and when work stops.

Saddle Creek Fire Rescue
Polk County Board of County Commissioners
Lunz Prebor Fowler Architects

END OF SECTION

SECTION 15183

REFRIGERANT PIPING

1.01 GENERAL

A. Submittals:

1. Product Data: Include pressure drop, based on manufacturer's test data, for thermostatic expansion valves, solenoid valves, and pressure-regulating valves.
2. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and equipment.
 - a. Size piping and design the actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes, to ensure proper operation and compliance with warranties of connected equipment.

B. ASHRAE Standard: Comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

C. ASME Standard: Comply with ASME B31.5, "Refrigeration Piping."

D. UL Standard: Provide products complying with UL 207, "Refrigerant-Containing Components and Accessories, Nonelectrical"; or UL 429, "Electrically Operated Valves."

1.02 PRODUCTS

A. Copper Tube and Fittings:

1. Drawn-Temper Copper Tube: ASTM B 280, Type ACR.
2. Wrought-Copper Fittings: ASME B16.22.
3. Wrought-Copper Unions: ASME B16.22.
4. Bronze Filler Metals: AWS A5.8, Classification BAg-1 (silver)

B. Refrigerant Piping Specialties:

1. Replaceable-Core Filter-Dryers: 500-psig (3450-kPa) maximum working pressure; heavy gage protected with corrosion-resistant-painted steel shell, flanged ring and spring, ductile-iron cover plate with steel cap screws; wrought-copper fittings for solder-end connections; with replaceable-core kit, including gaskets and the following:
 - a. Filter-Dryer Cartridge: Pleated media with solid-core sieve with activated alumina, ARI 730 rated for capacity.

1.03 EXECUTION

A. Piping Applications:

1. Aboveground, within Building: Type ACR drawn-copper tubing.

B. Piping Installation:

1. Install refrigerant piping according to ASHRAE 15. Equipment manufacturer shall size refrigerant lines for Contractor.
 2. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
 3. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
 4. Arrange piping to allow inspection and service of compressor and other equipment. Install valves and specialties in accessible locations to allow for service and inspection.
 5. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
 6. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.
 7. Slope refrigerant piping as follows:
 - a. Install horizontal suction lines with a uniform slope downward to compressor.
 - b. Install traps and double risers to entrain oil in vertical runs.
 - c. Liquid lines may be installed level.
 8. Hanger, support, and anchor products are specified in Division 15 Section "Hangers and Supports."
 9. Install the following pipe attachments:
 - a. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6.0 m) long.
 10. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
 - a. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - b. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - c. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
 - d. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 - e. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 11. Support vertical runs at each floor.
 12. Pipe Joint Construction:
 - a. Braze joints according to Division 15 Section "Basic Mechanical Materials and Methods."
 - b. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide) during brazing to prevent scale formation.
 13. Refrigerant Pipe Insulation:
 - a. Insulate refrigerant piping according to Division 15 Section "Pipe Insulation."
- C. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.
1. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure.

2. Test high- and low-pressure side piping of each system at not less than the lower of the design pressure or the setting of pressure relief device protecting high and low side of system.
 - a. System shall maintain test pressure at the manifold gage throughout duration of test.
 - b. Test joints and fittings by brushing a small amount of soap and glycerine solution over joint.
 - c. Fill system with nitrogen to raise a test pressure of 150 psig (1035 kPa) or higher as required by authorities having jurisdiction.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
- D. Adjust set-point temperature of the conditioned air controllers to the system design temperature.
- E. Before installing copper tubing other than Type ACR, clean tubing and fittings with trichloroethylene.
- F. Replace core of filter-dryer after system has been adjusted and design flow rates and pressures are established.
- G. Charge system using the following procedures:
 1. Install core in filter-dryer after leak test but before evacuation.
 2. Evacuate entire refrigerant system with a vacuum pump to a vacuum of 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
 4. Charge system with a new filter-dryer core in charging line. Provide full-operating charge.

END OF SECTION

SECTION 15410

PLUMBING FIXTURES

1.01 GENERAL

- A. Submit Product Data for selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates 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. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities," and Public Law 101-336, "Americans with Disabilities Act," about plumbing fixtures for people with disabilities.
- F. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- G. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- H. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- I. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Hand Sinks: NSF 2 construction.
 - 2. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
 - 3. Slip-Resistant Bathing Surfaces: ASTM F 462.
 - 4. Stainless-Steel Fixtures Other Than Service Sinks: ASME A112.19.3M.
 - 5. Vitreous-China Fixtures: ASME A112.19.2M.
 - 6. Water-Closet, Flush Tank, Tank Trim: ASME A112.19.5.
- J. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 - 1. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 - 2. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 - 3. Faucet Hose: ASTM D 3901.

4. Faucets: ASME A112.18.1M.
 5. Hose-Connection Vacuum Breakers: ASSE 1011.
 6. Hose-Coupling Threads: ASME B1.20.7.
 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 8. NSF Materials: NSF 61.
 9. Pipe Threads: ASME B1.20.1.
 10. Supply and Drain Fittings: ASME A112.18.1M.
- K. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
1. Atmospheric Vacuum Breakers: ASSE 1001.
 2. Brass and Copper Supplies: ASME A112.18.1M.
 3. Manual-Operation Flushometers: ASSE 1037.
 4. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.
- L. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Floor Drains: ASME A112.21.1M.
 2. Grab Bars: ASTM F 446.
 3. Hose-Coupling Threads: ASME B1.20.7.
 4. Off-Floor Fixture Supports: ASME A112.6.1M.
 5. Pipe Threads: ASME B1.20.1.
 6. Plastic Shower Receptors: ANSI Z124.2.
 7. Plastic Toilet Seats: ANSI Z124.5.
 8. Supply and Drain Protective Shielding Guards: ICC A117.1.
- M. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.
- 1.02 PRODUCTS
- A. Water Closets, WC-1, WC-2: Floor-mounting, floor-outlet, vitreous-china fixture designed for pressure-assisted siphon jet operation.
1. Products:
 - a. American Standard, Inc.; Cadet #2333.100, WC-1; #2377.100, WC-2.
 - b. Gerber; #21-312, WC-1; #21-318, WC-2.
 - c. Crane Plumbing/Fiat Products; Economiser #3835, WC-1; #3838, WC-2.
 - d. Kohler Co.; Wellworth #3458, WC-1; Highline #3544, WC-2.
 2. Style: Pressure-assisted flush tank.
 - a. Bowl Type: Elongated with siphon-jet design. Include bolt caps matching fixture.
 - b. Height: 15", WC-1; 17", WC-2.
 - c. Design Consumption: 1.6 gal./flush (6 L/flush).
 - d. Color: White.
 3. Supply Spud Size: NPS ½".
 4. Drain Piping: NPS 4 (DN 100).
 5. Toilet Seat: elongated open front seat less cover with stainless steel posts and sustaining check hinges; Bemis #1655SSC, Centoco #1500CCSS or Olsonite #95/SS.

B. Lavatories, L-1, L-2: Accessible, wall-hanging, vitreous-china fixture.

1. Products:
 - a. American Standard, Inc.; Lucerne #0355.012.
 - b. Gerber; Monticello #12-654.
 - c. Crane Plumbing/Fiat Products; Harwich #1412V.
 - d. Kohler Co.; Greenwich #K-2032.
2. Type: Integral backsplash with front overflow and faucet ledge.
3. Size: 20 by 18 inches (508 by 457 mm) rectangular.
4. Faucet Hole Punching: Three, 4-inch (102-mm) centers.
5. Color: White.
6. Faucet: 0.5 gpm spray outlet, single handle ADA compliant with polished chrome finish; American Standard #2385.003, Delta #523-WFHGMHDF, or Kohler #K-15597.
7. Supplies: NPS 3/8 (DN 10) chrome-plated copper with stops.
8. Drain: Grid.
9. Drain Piping: NPS 1-1/4 (DN 32) chrome-plated cast-brass trap; and wall escutcheon.
10. Protective Shielding Guards: McGuire ProWrap or Truebro Lav-Guard on LAV-2.
11. Fixture Support: Lavatory concealed arm supports by Josam, Smith or Zurn.

C. Sinks, S-1: Counter-mounting, 19 or 20 gauge 304 stainless-steel fixture.

1. Products:
 - a. Elkay Manufacturing Co.; Lustertone #PSR-3322.
 - b. Just Manufacturing Co.; Stylist #SL-2225A-GR.
 - c. Sterling Plumbing Group, Inc.; #B822-3.
2. Overall Size: 33 by 22 inches (838 by 559 mm).
3. Number of Compartments: Two.
4. Sink Faucet: High arc spout with 4" blade handles with polished chrome finish. American Standard Amarilis #8281.000.372V, Elkay #LK-2432-BH, Delta #27T2144.
5. Supplies: NPS 1/2 (DN 15) chrome-plated copper with stops and escutcheons.
6. Drain Piping: NPS 1-1/2 (DN 40) chrome-plated cast-brass trap, and wall escutcheon.

D. Sinks, SS-1: Comerical Sink, 18 gauge 304 stainless-steel fixture.

1. Products:
 - a. Advance Tabco; 9-1-24-24R.
2. Overall Size: 46 by 24 inches.
3. Number of Compartments: Single.
4. Number of Holes: Two.
5. Sink Faucet: Tube spout with 2" lever handles with polished chrome finish. Elkay #LK945TS08L2T, Elkay #LK18.
6. Supplies: NPS 1/2 (DN 15) chrome-plated copper with stops and escutcheons.
7. Drain Piping: NPS 1-1/2 (DN 40) chrome-plated cast-brass trap, and wall escutcheon.

E. Mop Sinks, MS-1: Flush-to-wall, floor-mounting precast terrazzo basin with rim guard, wall guard, faucet, hose attachment, and mop hanger.

1. Products:

- a. Stern-Williams; HL-1800.
 - b. Crane Plumbing/Fiat Products; TSB-3012.
 - c. Florestone Products Co.; Model 92.
2. Shape: Square.
 3. Size: 24 by 24 inches.
 4. Height: 12 inches with dropped front.
 5. Tiling Flange: On two sides.
 6. Rim Guard: Stainless steel on front top surface.
 7. Color: Platinum gray.
 8. Faucet: Chrome plated service sink faucet with wall brace, pail hook, integral stops, 8" centers wall flange, 3/4" hose threaded spout, center outlet with vacuum breaker; American Standard #8344.112, Delta #28T283, Fiat #830-AA.
 9. Drain: Grid with NPS 3 (DN 80) outlet.

1.03 EXECUTION

- A. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Fixture Installation:
 1. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
 2. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
 - a. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - b. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 - c. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
 3. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.
 4. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
 5. Install wall-hanging fixtures with tubular waste piping attached to supports.
 6. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.
 7. Install counter-mounting fixtures in and attached to casework.
 8. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
 9. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - a. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Division 15 Section "Valves" for general-duty valves. All valves shall be American made.
 10. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
 11. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

12. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
 13. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
 14. Install toilet seats on water closets.
 15. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
 16. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
 17. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
 18. Install shower, flow-control fittings with specified maximum flow rates in shower arms.
 19. Install traps on fixture outlets.
 - a. Exception: Omit trap on fixtures with integral traps.
 - b. Exception: Omit trap on indirect wastes, unless otherwise indicated.
 20. Install disposer in outlet of sinks indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
 21. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for escutcheons.
 22. Set shower receptors and service basins in leveling bed of cement grout. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for grout.
 23. Seal joints between fixtures and walls, floors, and counters 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.
- D. Connections: Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
1. Connect water supplies from water distribution piping to fixtures.
 2. Connect drain piping from fixtures to drainage piping.
 3. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
 4. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.
- E. 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.
- F. Field Quality Control:
1. Verify that installed fixtures are categories and types specified for locations where installed.
 2. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

3. Inspect installed fixtures for damage. Replace damaged fixtures and components.
 4. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
 5. Install fresh batteries in sensor-operated mechanisms.
- G. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- H. Operate and adjust hot-water dispensers and controls. Replace damaged and malfunctioning units.
- I. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.
- J. Replace washers and seals of leaking and dripping faucets and stops.
- K. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 2. Remove sediment and debris from drains.
- L. Provide protective covering for installed fixtures and fittings.
- M. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 15430

PLUMBING SPECIALTIES

1.01 GENERAL

- A. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
- C. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

1.02 PRODUCTS

- A. Backflow Preventers:
 - 1. General: ASSE standard, backflow preventers.
 - a. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
 - 2. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.
 - 3. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
 - 4. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves.
 - a. Pressure Loss: 10 psig (83 kPa) maximum, through middle 1/3 of flow range.
 - 5. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm (0.19-L/s) flow and applications with up to 10-foot head of water (30-kPa) back pressure. Include two check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7, garden-hose threads on outlet.
- B. Wheel-Handle Wall Hydrants: Frost-proof design similar to ASME A112.21.3M, for wall mounting with wheel-handle operation, NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, casing and operating rod to match wall thickness, and projecting outlet with ASME B1.20.7 garden-hose threads on outlet. Include wall clamp; integral vacuum breaker or nonremovable, damnable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052; and garden-hose threads complying with ASME B1.20.7 on outlet.
- C. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral or field-installed, nonremovable, damnable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.

1. Finish: Chrome or nickel plated.
 2. Operation: Operating key.
 3. Include operating key with each operating-key hose bibb.
 4. Include wall flange.
- D. Stack Flashing Fittings: Counter flashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
- E. Lead Sheet Flashing: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
 2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.

1.03 EXECUTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at intervals of 50 feet (15 m) or less for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
 4. Locate at base of each vertical soil and waste stack.
 5. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
 6. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- D. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Position floor drains for easy access and maintenance.

2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
 - b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
 - c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
1. Fasten recessed-type plumbing specialties to reinforcement built into walls.
 2. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.
- G. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.
- H. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- I. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.
- J. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- K. Connect plumbing specialties to piping specified in other Division 15 Sections.
- L. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
- M. Secure flashing into sleeve and specialty clamping ring or device.
- N. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings.
- O. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

- P. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- Q. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 15485

ELECTRIC, DOMESTIC WATER HEATERS

1.01 GENERAL

- A. Product Data: Submit for each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.
- E. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:
 - 1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.

1.02 PRODUCTS

- A. Light-Commercial, Non-storage, Tankless Electric Water Heaters: Comply with UL 174 or UL 1453, and listed by manufacturer for commercial applications.
 - 1. Storage Tank Construction: Non-ASME-code steel with 150-psig (1035-kPa) working-pressure rating.
 - a. Tappings: Factory fabricated of materials compatible with tank for piping connections, provide Webstone tankless water heater valves with relief valve, drain valve, isolation valves, etc.
 - b. Insulation: Comply with ASHRAE 90.1. Insulate all piping
 - c. Jacket: Steel, with enameled finish.
 - 2. Heating Elements: Electric element(s).
 - a. Temperature Control: Adjustable digital thermostat for each element with wiring arrangement located in accessible location.
 - b. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
 - 3. Drain Valve: Webstone.
 - 4. Option: Separate temperature and pressure relief valves are acceptable instead of combination relief valve.

- B. Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include pressure setting less than heat-exchanger working-pressure rating.
- C. Vacuum Relief Valves: Comply with ASME PTC 25.3. Furnish for installation in piping.
 - 1. Exception: Omit if water heater has integral vacuum-relieving device.
- D. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated, steel bracket for wall mounting and capable of supporting water heater.
- E. Piping Manifold Kits: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that is capable of isolating each water heater and of providing balanced flow through each water heater.

1.03 EXECUTION

- A. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- B. Anchor water heaters to substrate.
- C. Install temperature and pressure relief valves. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
- D. Install water heater drain piping as indirect waste to spill into open drains or over floor drains.
- E. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- F. Install piping adjacent to machine to allow service and maintenance.
- G. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.
- H. Make connections with dielectric fittings where piping is made of dissimilar metal.
- I. Electrical Connections: Power wiring and disconnect switches are specified in Division 16 Sections. Arrange wiring to allow unit service.
- J. 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.
- K. In addition to manufacturer's written installation and startup checks, perform the following:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 2. Verify that piping system tests are complete.
 - 3. Check for piping connection leaks.

4. Check for clear relief valve inlets, outlets, and drain piping.
5. Test operation of safety controls, relief valves, and devices.
6. Energize electric circuits.
7. Adjust operating controls.
8. Adjust hot-water-outlet temperature settings. Do not set above 120 deg F (50 deg C) unless piping system application requires higher temperature.
9. Balance water flow through manifolds of multiple-unit installations.

END OF SECTION

SECTION 15738

SPLIT-SYSTEM AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and are connected to ducts.

1.03 DEFINITIONS

- A. Evaporator-Fan Unit: The part of the split-system air-conditioning unit that contains a coil for cooling (heat rejection for heating operation in heat pump units) and a fan to circulate air to conditioned space.
- B. Compressor-Condenser Unit: The part of the split-system air-conditioning unit that contains a refrigerant compressor and a coil for condensing refrigerant (evaporator for heating operation in heat pump units).

1.04 SUBMITTALS

- A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For split-system air-conditioning units to include in maintenance manuals specified in Division 1.
- D. Warranties: Special warranties specified in this Section.

1.05 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

- 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.

1.06 COORDINATION

- A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

1.07 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within one year of date of acceptance.

1.08 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. Filters: One set of filters for each unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carrier Air Conditioning; Div. of Carrier Corp.
 - 2. Lennox Industries Inc.
 - 3. Trane Co. (The); Unitary Products Group.
 - 4. York International Corp.

2.02 CONCEALED EVAPORATOR-FAN COMPONENTS

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

1. Insulation: Faced, glass-fiber duct liner.
 2. Drain Pans: Galvanized steel or PVC, with connection for drain; insulated.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.
- D. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- E. Fan Motor: Multispeed, PSC type.
- F. Disposable Filters: 1 inch (25 mm) thick, in fiberboard frames.
- G. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.03 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

- A. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
1. Compressor Type: Scroll.
 2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
- D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.
- E. Fan: Aluminum-propeller type, directly connected to motor.
- F. Motor: Permanently lubricated, with integral thermal-overload protection.
- G. Low Ambient Kit: Permits operation down to 45 deg F (7 deg C).
- H. Mounting Base: Polyethylene.

2.04 ACCESSORIES

- A. Digital Thermostat: Low voltage with subbase and LCD panel to control compressor and evaporator fan.
- B. Automatic-reset timer to prevent rapid cycling of compressor.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure. Provide rubber inshear isolators between frame assembly and building structure to reduce vibration transmission.
- C. Install ground-mounted, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base; 4 inches (100 mm) larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 3, "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Unless otherwise indicated, connect piping with unions and shutoff valves to allow units to be disconnected without draining piping. Refer to piping system Sections for specific valve and specialty arrangements.
- 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.

3.03 FIELD QUALITY CONTROL

- A. Installation Inspection: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections, and to prepare a written report of inspection.
- B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new components, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.04 COMMISSIONING

- A. Engage a factory-authorized service representative to perform startup service.
- B. Verify that units are installed and connected according to the Contract Documents.
- C. Lubricate bearings, adjust belt tension, and change filters.
- D. Perform startup checks according to manufacturer's written instructions and do the following:
 - 1. Fill out manufacturer's checklists.
 - 2. Check for unobstructed airflow over coils.
 - 3. Check operation of condenser capacity-control device.
 - 4. Verify that vibration isolation devices and flexible connectors dampen vibration transmission to structure.

3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.
 - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining units.
 - 2. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
 - 3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
 - 4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 15815

DUCTWORK

1.01 GENERAL

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

1.02 PRODUCTS

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).
- D. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber fabric reinforced.
- E. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.
- F. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.
- G. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
- H. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- I. Trapeze and Riser Supports: Galvanized steel shapes complying with ASTM A 36/A 36M.
- J. Rectangular Duct Fabrication: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
- K. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:
 - 1. Supply Ducts: 2-inch wg (500 Pa).
 - 2. Return Ducts: 2-inch wg (500 Pa), negative pressure.
 - 3. Exhaust Ducts: 2-inch wg (500 Pa), negative pressure.
- L. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of unbraced panel area, unless ducts are lined.

- M. Round Duct Fabrication: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- N. Round Supply and Exhaust Fitting Fabrication: Fabricate 90-degree tees and laterals and conical tees to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal seam straight duct.
 - 1. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from body onto branch tap entrance.
 - 2. Elbows: Fabricate in pleated or mitered construction complying with SMACNA's "HVAC Duct Construction Standard--Metal and Flexible," unless otherwise indicated. Fabricate bend radius of elbows one and one-half times elbow diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
 - a. 90-Degree, Two-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material-handling classes A and B; and only where space restrictions do not permit using 1.5 bend radius elbows. Fabricate with single-thickness turning vanes.
 - b. Round Elbows, 8 Inches (200 mm) and Smaller: Fabricate pleated elbows for 30, 45, 60, and 90 degrees. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.
 - c. Round Elbows, 9 through 14 Inches (225 through 355 mm): Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees, unless space restrictions require a mitered elbow. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.
 - d. Round Elbows, Larger Than 14 Inches (355 mm): Fabricate gored elbows, unless space restrictions require a mitered elbow.

1.03 EXECUTION

- A. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.
- B. Construct and install each duct system for the specific duct pressure classification indicated.
- C. Install round ducts in lengths not less than 12 feet (3.7 m), unless interrupted by fittings.
- D. Install ducts with fewest possible joints.
- E. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
- F. Install couplings tight to duct wall surface with a minimum of projections into duct.
- G. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
- H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- I. Install ducts with a clearance of 1-1/2 inch (38 mm), plus allowance for insulation thickness.
- J. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

- K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches (38 mm).
- N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers are specified in Division 15 Section "Duct Accessories."
- O. Seam and Joint Sealing: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
 - 1. Pressure Classification Less Than 2-Inch wg (500 Pa): Transverse joints.
 - 2. Seal externally insulated ducts before insulation installation.
- P. Install rigid round and rectangular metal duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- Q. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- R. Support vertical ducts at a maximum interval of 16 feet (5 m) and at each floor.
- S. Install concrete inserts before placing concrete.
- T. Connect equipment with flexible connectors according to Division 15 Section "Duct Accessories."
- U. For branch, outlet, and inlet, comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

END OF SECTION

SECTION 15820
DUCT ACCESSORIES

1.01 GENERAL

- A. Submittals: Product Data for backdraft dampers, manual-volume dampers, fire and smoke dampers, duct-mounted access doors and panels, and flexible ducts.
- B. NFPA Compliance: Comply with the following NFPA standards:
 - 1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

1.02 PRODUCTS

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless steel ducts.
- C. Tie Rods: Galvanized steel, 1/4- (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).
- D. Backdraft Dampers: Suitable for horizontal or vertical installations.
- E. Frame: 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel, with welded corners and mounting flange.
- F. Blades: 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.
- G. Blade Seals: Felt, vinyl, or neoprene.
- H. Blade Axles: Galvanized steel.
- I. Tie Bars and Brackets: Galvanized steel.
- J. Return Spring: Adjustable tension.
- K. Manual-Volume Dampers: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
- L. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
 - 1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch (1.62 mm) thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installation in ducts.

2. Blade Axles: Galvanized steel.
 3. Tie Bars and Brackets: Galvanized steel.
- M. Jackshaft: 1-inch- (25-mm-) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
- N. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
- O. Fire Dampers: Labeled to UL 555.
1. Fire Rating: One and one-half hours.
 2. Frame: With blades out of airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
 3. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel, with a minimum thickness of 0.052 inch (1.3 mm) or 0.138 inch (3.5 mm), and length to suit application.
 4. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized steel blade connectors.
 5. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.
 6. Fusible Link: Replaceable, 165 deg F (74 or 100 deg C) rated or as indicated.
- P. Smoke Dampers: Labeled to UL 555S. Combination fire and smoke dampers shall be labeled for one-and-one-half-hour rating to UL 555.
1. Fusible Link: Replaceable, 165 or 212 deg F (74 or 100 deg C) rated as indicated.
 2. Frame and Blades: 0.064-inch- (1.62-mm-) thick, galvanized, sheet steel.
 3. Mounting Sleeve: Factory-installed, 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel; length to suit wall or floor application.
- Q. Smoke-Damper Motors: Provide for two-position action.
1. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 2. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf. and breakaway torque rating of 150 in. x lbf..
 3. Outdoor Motors and Motors in Outside-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 4. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.
 5. Two-Position Motor: 115 V, single phase, 60 Hz.
- R. Turning Vanes: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
1. Manufactured Turning Vanes: Fabricate of 1-1/2-inch- wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into side strips suitable for mounting in ducts.
- S. Duct-Mounted Access Doors and Panels: Fabricate doors and panels airtight and suitable for duct pressure class.

1. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.
 2. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.
 3. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
 4. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.
- T. Flexible Connectors: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- U. Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.
- V. Flexible Connector Fabric: Glass fabric double coated with polychloroprene.
1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.
- W. Flexible Ducts, Uninsulated: Comply with UL 181, Class 1. Spiral-wound steel spring with flameproof vinyl sheathing.
- X. Flexible Ducts, Insulated: Comply with UL 181, Class 1. Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- (38-mm-) thick, glass-fiber insulation around a continuous inner liner.
1. Reinforcement: Steel-wire helix encapsulated in inner liner.
 2. Outer Jacket: Polyethylene film.
 3. Inner Liner: Polyethylene film.
- Y. Pressure Rating: 6-inch wg (1500 Pa) positive, 1/2-inch wg (125 Pa) negative.
- Z. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.
- AA. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.
- BB. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.
- 1.03 EXECUTION
- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.
 - B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.
 - C. Provide test holes at fan inlet and outlet and elsewhere as indicated or required by the test and balance contractor.

- D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.
 - 1. Install fusible links in fire dampers.
- E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.
 - 1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
 - 2. Install access panels on side of duct where adequate clearance is available.
- F. Label access doors according to Division 15 Section "Basic Mechanical Materials and Methods."

END OF SECTION

SECTION 15838

POWER VENTILATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Centrifugal wall ventilators.
 - 2. Ceiling-mounting ventilators.
 - 3. In-line centrifugal fans.
 - 4. Propeller fans.

1.03 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base air ratings on sea-level conditions.
- B. Operating Limits: Classify according to AMCA 99.

1.04 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material gages and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
 - 2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

- C. Coordination Drawings: Show roof penetration requirements and reflected ceiling plans drawn to scale and coordinating roof penetrations and units mounted above ceiling. Show the following:
 - 1. Roof framing and support members relative to duct penetrations.
 - 2. Ceiling suspension assembly members.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- D. Maintenance Data: For power ventilators to include in maintenance manuals specified in Division 1.

1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. UL Standard: Power ventilators shall comply with UL 705.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

1.07 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

1.08 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. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Centrifugal Wall Ventilators:
 - a. Acme Engineering & Mfg. Corp.
 - b. Carnes Company HVAC.
 - c. Cook, Loren Company.
 - d. Dayton Electric Manufacturing Co.
 - e. Greenheck Fan Corp.
 - f. Penn Ventilation Companies, Inc.
 - 2. Ceiling-Mounting Ventilators:
 - a. Carnes Company HVAC.
 - b. Cook, Loren Company.
 - c. Dayton Electric Manufacturing Co.
 - d. Greenheck Fan Corp.
 - e. Penn Ventilation Companies, Inc.
 - 3. In-Line Centrifugal Fans:
 - a. Acme Engineering & Mfg. Corp.
 - b. Carnes Company HVAC.
 - c. Cook, Loren Company.
 - d. Greenheck Fan Corp.
 - e. Penn Ventilation Companies, Inc.
 - 4. Propeller Fans:
 - a. Big-Ass Fan Co. (Where specifically indicated)
 - b. Carnes Company HVAC.
 - c. Chicago Blower Corp.
 - d. Cincinnati Fan & Ventilator Co.
 - e. Cook, Loren Company.
 - f. Greenheck Fan Corp.
 - g. Penn Ventilation Companies, Inc.

2.02 CENTRIFUGAL WALL VENTILATORS

- A. Description: Direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and accessories.
- B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; venturi inlet cone.
- C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.
- D. Accessories:
 - 1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through internal aluminum conduit.
 - 2. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum or brass wire.
 - 3. Wall Grille: Ring type for flush mounting.
 - 4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in wall sleeve; factory set to close when fan stops.

2.03 CEILING-MOUNTING VENTILATORS

- A. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.
- B. Housing: Steel, lined with acoustical insulation.
- C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- D. Grille: Stainless steel, louvered grille with flange on intake and thumbscrew attachment to fan housing.
- E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.
- F. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.
 - 2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
 - 3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
 - 4. Filter: Washable aluminum to fit between fan and grille.
 - 5. Isolation: Rubber-in-shear vibration isolators.

2.04 IN-LINE CENTRIFUGAL FANS

- A. Description: In-line, direct-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

- C. Direct-Driven Units: Motor encased in housing outside of airstream, factory wired to disconnect switch located on outside of fan housing.
- D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- E. Accessories:
 - 1. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
 - 2. Companion Flanges: For inlet and outlet duct connections.
 - 3. Fan Guards: 1/2- by 1-inch (13- by 25-mm) mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.

2.05 PROPELLER FANS

- A. Description: Direct-driven propeller fans consisting of fan blades, hub, housing, orifice ring, motor, drive assembly, and accessories.
- B. Housing: Galvanized steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.
- C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.
- D. Fan Wheel: Replaceable, cast aluminum airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.
- E. Accessories:
 - 1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
 - 2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
 - 3. Wall Sleeve: Galvanized steel to match fan and accessory size.
 - 4. Weathershield Hood: Galvanized steel to match fan and accessory size.
 - 5. Weathershield Front Guard: Galvanized steel with expanded metal screen.
 - 6. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.
 - 7. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
 - 8. For Big-Ass Fans, provide complete control panel assembly.

2.06 MOTORS

- A. Refer to Division 15 Section "Motors" for general requirements for factory-installed motors.
- B. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.
- C. Enclosure Type: Open drip-proof.

2.07 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Support units using neoprene isolators.
 - 1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.
- C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
- D. Support suspended units from structure using threaded steel rods and RIS hangers. Vibration-control devices are specified in Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."
- E. Install units with clearances for service and maintenance.
- F. Label units according to requirements specified in Division 15 Section "Mechanical Identification."

3.02 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment.
- D. 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.

3.03 FIELD QUALITY CONTROL

A. Equipment Startup Checks:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Verify lubrication for bearings and other moving parts.
6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
7. Disable automatic temperature-control operators.

B. Starting Procedures:

1. Energize motor and adjust fan to indicated rpm.
2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.04 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Lubricate bearings.

3.05 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain power ventilators.
 - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
 - 2. Review data in maintenance manuals. Refer to Division 1 Section "Closeout Procedures."
 - 3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
 - 4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION

SECTION 15855

DIFFUSERS, REGISTERS, AND GRILLES

1.01 GENERAL

- A. Submittals: Product Data for each model indicated.
- B. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
- C. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.

1.02 PRODUCTS

- A. Diffusers, registers, and grilles are scheduled on Drawings.
 - 1. Acceptable Manufacturers:
 - a. Air Systems Components; Krueger Div.
 - b. Metal Industries, Inc.; MetalAire Div.
 - c. Nailor Industries Inc.
 - d. Titus.

1.03 EXECUTION

- A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.
- D. Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."
- E. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

SECTION 15990

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
 - 1. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
 - 2. Adjusting total HVAC systems to provide indicated quantities.
 - 3. Measuring electrical performance of HVAC equipment.
 - 4. Setting quantitative performance of HVAC equipment.
 - 5. Verifying that automatic control devices are functioning properly.
 - 6. Reporting results of the activities and procedures specified in this Section.
- B. Related Sections include the following:
 - 1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
 - 2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.03 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.
- C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- E. Report Forms: Test data sheets for recording test data in logical order.

- F. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- G. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- H. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- I. Test: A procedure to determine quantitative performance of a system or equipment.
- J. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.
- K. AABC: Associated Air Balance Council.
- L. AMCA: Air Movement and Control Association.
- M. NEBB: National Environmental Balancing Bureau.
- N. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.04 SUBMITTALS

- A. Certified Testing, Adjusting, and Balancing Reports: Submit copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.
- B. Warranty information shall be submitted to the Engineer for review and approval.

1.05 QUALITY ASSURANCE

- A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.
- B. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
 - 2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.
- C. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- D. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

- E. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 PROJECT CONDITIONS

- A. Partial City Occupancy: The City may occupy completed areas of the building before Substantial Completion. Cooperate with the City during testing, adjusting, and balancing operations to minimize conflicts with the City's operations.

1.07 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
- B. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.

1.08 WARRANTY

- A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the City of other rights the City may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. National Project Performance Guarantee: Provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents or provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:
 - 1. The certified Agent has tested and balanced systems according to the Contract Documents.
 - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
 - 1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
 - 2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine project record documents described in Specific Provisions.
- D. Examine Architect's and Engineer's design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data, including fan curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
- F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
- G. Examine system and equipment test reports.
- H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- J. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- K. Examine equipment for installation and for properly operating safety interlocks and controls.

- L. Examine automatic temperature system components to verify the following:
 - 1. Dampers, valves, and other controlled devices operate by the intended controller.
 - 2. Dampers and valves are in the position indicated by the controller.
 - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
 - 4. Thermostats are located to avoid adverse effects of sunlight, drafts, and cold walls.
 - 5. Sensors are located to sense only the intended conditions.
 - 6. Sequence of operation for control modes is according to the Contract Documents.
 - 7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
 - 8. Interlocked systems are operating.
 - 9. Changeover from heating to cooling mode occurs according to design values.
- M. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.02 PREPARATION

- A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Automatic temperature-control systems are operational.
 - 3. Equipment and duct access doors are securely closed.
 - 4. Balance and fire dampers are open.
 - 5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 6. Windows and doors can be closed so design conditions for system operations can be met.

3.03 GENERAL TESTING AND BALANCING PROCEDURES

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards and this Section or the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.
- C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.04 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- C. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- D. Verify that motor starters are equipped with properly sized thermal protection.
- E. Check dampers for proper position to achieve desired airflow path.
- F. Check for airflow blockages.
- G. Check condensate drains for proper connections and functioning.
- H. Check for proper sealing of air-handling unit components.

3.05 HEAT-TRANSFER COILS

- A. Electric-Heating Coils: Measure the following data for each coil:
 - 1. Nameplate data.
 - 2. Airflow.
 - 3. Entering- and leaving-air temperatures at full load.
 - 4. Voltage and amperage input of each phase at full load and at each incremental stage.
 - 5. Calculated kW at full load.
 - 6. Fuse or circuit-breaker rating for overload protection.

3.06 TEMPERATURE TESTING

- A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

3.07 TOLERANCES

- A. Set HVAC system airflow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans: 0 to plus 10 percent.
 - 2. Air Outlets and Inlets: 0 to minus 10 percent.

3.08 REPORTING

- A. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.09 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
 - 1. Include a list of the instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to the certified field report data, include the following:
 - 1. Manufacturers' test data.
 - 2. Field test reports prepared by system and equipment installers.
 - 3. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.
- D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
 - 1. Title page.
 - 2. Name and address of testing, adjusting, and balancing Agent.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of testing, adjusting, and balancing Agent who certifies the report.
 - 10. Summary of contents, including the following:
 - a. Design versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 11. Nomenclature sheets for each item of equipment.
 - 12. Data for terminal units, including manufacturer, type size, and fittings.
 - 13. Notes to explain why certain final data in the body of reports vary from design values.
- E. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
 - 1. Unit Data: Include the following:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.

- d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches (mm), and bore.
 - i. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).
 - j. Number of belts, make, and size.
 - k. Number of filters, type, and size.
 - 2. Motor Data: Include the following:
 - a. Make and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches (mm), and bore.
 - f. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).
 - 3. Test Data: Include design and actual values for the following:
 - a. Total airflow rate in cfm (L/s).
 - b. Total system static pressure in inches wg (Pa).
 - c. Outside airflow in cfm (L/s).
 - d. Return airflow in cfm (L/s).
 - e. Outside-air damper position.
 - f. Return-air damper position.
- F. Fan Test Reports: For supply, return, and exhaust fans, include the following:
- 1. Fan Data: Include the following:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - 2. Test Data: Include design and actual values for the following:
 - a. Total airflow rate in cfm (L/s).
 - b. Total system static pressure in inches wg (Pa).
- G. Air-Terminal-Device Reports: For terminal units, include the following:
- 1. Unit Data: Include the following:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Test apparatus used.
 - d. Area served.
 - e. Air-terminal-device make.
 - f. Air-terminal-device number from system diagram.

- g. Air-terminal-device type and model number.
 - h. Air-terminal-device size.
- 2. Test Data: Include design and actual values for the following:
 - a. Airflow rate in cfm (L/s).
 - b. Air velocity in fpm (m/s).
 - c. Preliminary airflow rate as needed in cfm (L/s).
 - d. Preliminary velocity as needed in fpm (m/s).
 - e. Final airflow rate in cfm (L/s).
 - f. Final velocity in fpm (m/s).
 - g. Space temperature in deg F (deg C).

3.010 ADDITIONAL TESTS

- A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION

SECTION 16050

BASIC MATERIALS & METHODS

1. GENERAL

- A. General Conditions of the entire Specifications apply to work under this section.

1.1 DRAWINGS AND SPECIFICATIONS

- A. Intent of Drawings and Specifications is to obtain a complete and satisfactory installation. An attempt has been made to separate and completely define work of each trade. However, such separations of drawings and specifications should not relieve Contractor from responsibility of compliance with work pertinent to his trade which may be indicated on any drawings or in any Section of the specifications.
- B. Contractor shall carefully examine the Architectural, Civil, Structural, Mechanical, and Electrical drawings and specifications prior to submitting his bid.
- C. Contractor shall furnish, install and connect with appropriate services all items shown on any of the drawings. Architect shall be notified of any discrepancies, omissions, conflicts or interference's which occur between drawings and specifications. Should notification be received in adequate time, additional data or changes will be issued by addendum to all bidders.
- D. Architectural Drawings take precedence over Electrical Drawings with reference to building construction. The drawings are not intended to show in complete detail every fitting which may be required; however, wherever reasonably implied by the nature of the work, such materials or equipment shall be provided as required to complete the work.
- E. The term "provide" shall mean to furnish and install completely unless otherwise indicated.
- F. If Electrical Contractor has questions, or in their opinion, finds omissions or errors on these Electrical Documents, it is their responsibility to bring this to the attention of the Electrical Engineer, Architect and Owner immediately.

1.2 EXAMINATION OF SITE

- A. Bidders are to visit the site and familiarize themselves with existing conditions and satisfy themselves as to the nature and scope of the work. The submission of a bid will be evidence that such an examination has been made. Later claims for labor, equipment, or materials required, or for difficulties encountered which could have been foreseen had an examination been made, will not be allowed.

1.3 CODES

- A. Materials and installation, as a minimum, are to conform with the latest edition of the National Electrical Code, the latest edition of the N.F.P.A., and the latest editions of the local codes and ordinances, including all amendments to the N.E.C. equipment, where applicable, will be listed with the Underwriters' Laboratories, Inc. Quality and workmanship established by drawings and specifications are not to be reduced by the above mentioned codes.
- B. Should a code conflict exist, Contractor shall report conflict to Architect before submitting his bid. Should contractor fail to notify Architect, the change required to comply with codes,

- ordinances, etc., will be at Contractor's expense.
- C. Comply with applicable requirements of NEMA Standards Publications pertaining to materials and equipment installed.
- D. Comply with applicable requirements of UL safety standards pertaining to electrical systems. Provide products and components which have UL listing or labeling.

1.4 INSPECTIONS, PERMITS AND FEES

- A. Contractor shall obtain necessary inspections and permits, including those required to connect to utilities, and pay charges as required. Certificates of inspection issued by authorities having jurisdiction, shall be delivered to the Architect.

1.5 DAMAGE TO OTHER WORK AND PERSONNEL

- A. Contractor shall be responsible for proper protective measures when working overhead or in finished areas. Contractor shall repair, replace, or touch up finished surfaces which are damaged as a result of his work or operations.
- B. Contractor shall carry suitable insurance as prescribed by law and as required under the General Specifications paragraphs for protection of his employees, other persons, materials, and equipment on building site.

1.6 MATERIAL LIST, SHOP DRAWINGS, AND PRIOR APPROVAL

- A. Materials and equipment specified have been used as a basis for design. Products of other manufacturers will be considered for use, if, as determined by the Architect and Engineer, the item requested for substitution is equal to that specified.
- B. Contractor shall ascertain that substituted products meet specifications and that size and arrangement is suitable for installation. Additional cost of installation will be at Contractor's expense.
- C. Request for substitutions shall clearly and specifically indicate any and all differences between the product specified as basis of design and the product proposed for substitution. Should Contractor fail to call the Architect's attention to differences of approved substitutes, Architect reserves the right to require equal and/or similar features to be added to substitute product at Contractor's expense.
- D. Contractor shall submit six (6) copies of a complete list of material and equipment for approval by the Architect within ten (10) days after notice to proceed. List should describe type of materials, capacities, and catalog numbers of equipment and give such information as is necessary for checking equipment for approval.
- E. Within thirty (30) days after award of contract, Contractor shall submit six (6) copies of equipment shop drawings for Engineer's approval. Submittals should be complete, neatly assembled, bear submitting Contractor's seal of approval, and show information necessary to identify each piece of equipment and illustrate its compliance with specifications.
- F. Contractor shall provide two (2) copies of shop drawing submittals for lighting fixtures, switchgear, wiring devices, emergency generator or transfer equipment and all systems (fire alarm, security, etc.) ten (10) days prior to bid date for Engineer's approval. Engineer's approval of the prior approval package will be considered preliminary. Final approval will be contingent upon review of final shop drawings. All proposed alternates must be industry standard equals to the items specified as the basis of design; however, if the items are not considered equal by the Engineer, it shall be disapproved for submittal. If Electrical Contractor/General Contractor does not submit shop drawings

to Electrical Engineer for items listed above, Electrical Engineer will not be responsible for any, and/or omissions or errors due to shop drawings not submitted. Shop drawings will only be reviewed twice as part of this contract. Additional shop drawing reviews shall be invoiced at \$85.00 per hour, billable to the sub-contractor, C.O.D.

- G. Contractor shall provide two (2) copies of the proposed site light fixture package ten (10) days prior to bid date for engineer's approval to submit. Engineer's approval of the prior approval package will be considered preliminary. Final approval will be contingent upon review of final shop drawings. All proposed alternates must be industry standard equals to the site fixtures specified as the basis of design; however, if the site fixture is not considered equal by the engineer, it shall be disapproved for final submittal. Alternate site fixtures shall include a computer generated, point by point photometric calculation based on the (plans) fixture characteristics and pole placement shall not be altered). This diagram shall show composite values of the illuminance projected from the arrangement of light sources as shown on plan. Computer plot diagram shall also show the locations of the poles and the mounting height used in the calculations with the fixture catalog number being used.

1.7 RECORD DRAWINGS

- A. Contractor shall maintain a complete set of contract drawings at job site with colored markings indicating progress of work. This set of contract drawings is to be separate from and in addition to Contractor's construction set. Every unit of equipment, device, conduit, and wire is to be marked when installed. Use GREEN to indicate installation as shown on drawings. Use RED to indicate field changes.
- B. Upon completion of work, this set of contract drawings is to be turned over to, and become the property of the Architect.

1.8 SUPERVISION OF WORK

- A. Contractor's Superintendent shall be experienced, qualified and on the job when work is in progress.
- B. Superintendent who is incompetent, in opinion of Architect, will be immediately replaced upon written request. Satisfactory Superintendent will not be withdrawn without consent of Architect.

1.9 CONNECTING TO WORK OF OTHERS

- A. Before starting work under this division of the Specifications and from time to time as work progresses, Contractor shall examine work and materials installed under other divisions of the Specifications insofar as they apply to his work and should notify the Architect immediately, in writing, should conditions exist which prevent satisfactory results in installation of system.
- B. Should Contractor start work without such notification, he shall remove and replace, at his own expense, any work under this division of the Specifications required due to such conditions.

1.10 CUTTING, PATCHING, AND EXCAVATION

- A. Cutting and patching of walls, partitions, floors, concrete, pits, and chases in wood and masonry shall be done by Contractor as provided on the drawings or as directed by the Architect. Cutting of steel, wood, concrete slabs, or other main structural members must be approved by the Architect prior to cutting.
- B. Contractor shall do all necessary excavation and backfilling incidental to work and is to be as specified in Excavation and Backfill Division of Specifications.

- C. Contractor shall be responsible for sealing all conduit penetrations made through fire rated walls, ceilings, slabs, etc. Penetration seals shall be per U.L. assembly standard.

1.11 CLEANING AND ADJUSTMENTS

- A. Upon completion of work, Contractor shall clean all lighting fixtures, device plates, equipment enclosures, trim flanges, etc. furnished under this section of specifications. Operable equipment and enclosures will be adjusted and made ready for testing.

1.12 REMOVAL OF RUBBISH

- A. Contractor shall, at all times, keep premises free from accumulations of waste materials or rubbish caused by his employees or work. At completion of work, all tools, scaffolding, materials, and rubbish shall be removed from building site. Premises shall be left in a clean and orderly condition acceptable to the Architect.

1.13 ACCEPTANCE

- A. Seven (7) days prior to date of requested Final Inspection, Contractor shall:
 - 1. Complete work under his contract.
 - 2. Furnish to the Architect certificates of inspection issued by authorities.
 - 3. Acceptance will be by Architect on the basis of tests and inspection of the job. Contractor shall furnish necessary equipment and assist with Final Inspection.

1.14 GUARANTEE AND SERVICE

- A. In addition to guarantee of equipment by manufacturer, Contractor shall also guarantee such equipment which will include tests, adjustments and/or replacements of defective equipment, materials, and workmanship for a period of one (1) year from final acceptance of building by Architect.
- B. Contractor shall furnish three (3) complete sets of operation instructions applying to each piece of equipment installed, including parts lists and maintenance brochures.

2. PRODUCTS

2.1 RACEWAYS

- A. For each electrical raceway system required, provide a complete assembly of conduit, tubing or duct, with fittings including, but not necessarily limited to, connectors, nipples, couplings, elbows, outlet box covers, expansion fittings and other components and accessories as required for a complete system.
- B. Rigid steel conduit shall be galvanized and produced to Federal Specifications WW-C-581.
- C. PVC conduit shall be Schedule 40.
- D. Each length of conduit or tubing shall bear the Underwriters' Laboratories seal of inspection.
- E. Conduit installation shall follow layout shown on drawings. However, layout is diagrammatic only, and where changes are necessary due to structural conditions, interferences with other apparatus or other causes, such changes shall be made without additional cost to the Owner. Offsets in conduits are not indicated but shall be installed as required by the conditions.
- F. Empty raceways shall have pull lines installed, Jet Line No. 232 Polyolefin pull line, or approved equal.

- G. Verify exact stub-up location and termination requirements for items and equipment being served, for all necessary power and control circuits.
- H. Provide four 3/4 inch spare conduits from top of each flush- mounted lighting power panel, telephone cabinet, and miscellaneous system cabinets. Stub into ceiling space (where applicable).

2.2 BOXES AND FITTINGS

- A. Boxes, fittings, clamps, hangers, etc. shall be galvanized steel or rust resistant malleable iron alloy compatible with raceway system and manufactured by Appleton, Steel City, or Thomas & Betts.
- B. Outlet boxes for fixtures and miscellaneous devices shall be one-piece, hot dipped galvanized stamped steel. Depth of boxes varies with construction materials. Galvanized steel plaster covers or extension rings shall be provided where required.
- C. Junction boxes shall be galvanized code gauge steel with screw covers. All exposed surfaces shall be finished with rust resistant enamel to match adjacent surfaces.
- D. Outlet boxes for exterior application shall be case alloy with gasketed cast alloy cover and threaded watertight conduit hubs.
- E. Outlet boxes shall be provided with fixture stubs where applicable.
- F. EMT connectors, couplings and miscellaneous fittings shall be steel set-screw type. Pot metal type and "sock-on" type fittings shall not be used.
- G. Switch and receptacle outlet boxes shall not be less than 4 inches square by 1 1/2 inches deep with standard device covers. Boxes in exposed masonry to be square corner type. Thru-wall boxes shall not be installed in any location.

2.3 CONDUCTORS

- A. Provide 98% Conductivity copper, solid for #10 AWG and smaller and IPCEA standard stranding for #8 AWG and larger. Unless otherwise noted, conductor sizes #6 AWG and smaller shall have a moisture resistant thermoplastic insulation, type THWN (75 degree C wet or dry). Conductor sizes #4 AWG and larger shall have moisture and heat resistant thermoplastic insulation, type THWN (75 degree C wet or dry).
- B. Type MC (Metal Clad) cable may be used where code permits.

2.4 WIRING DEVICES

- A. All general purpose switches and receptacles shall be the product of a single manufacturer. Catalog numbers listed are Leviton. However, comparable devices by Pass and Seymour, Bryant, or Arrow Hart will be accepted. Color selected by architect.
 - 1. Switches: Single Pole - Leviton #CSB1-20I
Switches: Three-Way - Leviton #CSB3-20I
Dimmers: Single Pole Leviton
(All other required switches shall match in color and style.)
 - 2. Receptacles: Duplex Outlet - Leviton #BR20-I
(All other receptacles shall match in color and style.)
 - 3. Cover Plates: Smooth Nylon (80700 Series) and Stainless Steel, where applicable.
Plates shall be provided for all wiring devices, data, and telephone outlet boxes. Plates shall be of suitable configuration for the number and type of device for which it is the cover. Telephone and

data wall plates shall be provided as required for systems installed. Plates shall be one-piece type.

4. Telephone and data outlet cover plates shall match those specified for adjacent wiring devices, including those with special finishes.
5. Provide corrosion-resistant "in use" device cover plates for all locations marked weatherproof "WP".
6. Provide "weather resistant" devices for all locations marked "WR".

2.5 PANELBOARDS

- A. All panelboards shall be the product of a single manufacturer. Catalog numbers and descriptive data on plans and contained herein are those of Square 'D'. However, comparable equipment by Siemens, General Electric or Cutler-Hammer only will be accepted.
- B. See Branch Circuit Schedules on plans for panelboard type, location, mounting, bussing, and branch circuit arrangement. Note that dimensions may be critical; do not exceed dimensions of the specified manufacturer without prior approval.
- C. All panelboards shall be circuit breaker type with dead front trim, lock type hinged door, distributed phase bussing and are to have medium grey enamel finish.
- D. Branch circuit breakers shall be ambient compensating thermal magnetic type. Two and three pole breakers shall have common trip handle. Tandem circuit breakers shall not be used.

2.6 DISCONNECT SWITCHES

- A. Furnish general duty disconnect switches rated in accordance with NEMA Standard KS-1-1990, unless specified otherwise on drawings. Switches shall be a product of the same manufacturer as panelboards, using a quick-make, quick-break mechanism.
- B. Exterior units shall have NEMA 3R or 4 (rain tight or watertight) enclosures as indicated. Other types of enclosures than NEMA 1 for interior locations shall be provided to suit installation conditions.

2.7 FUSES

- A. All fuses for safety switches shall be dual element, cartridge type. Fuses shall be those manufactured by either Bussman or Littlefuse. The Contractor shall furnish and install fuses specified and shall also furnish to the Owner one spare fuse for each size and type of fuse installed. Fuses 600 Amps or less shall be Class RK1, typical unless otherwise noted. Fuses over 600 Amps shall be Class L.

2.8 LIGHTING FIXTURES

- A. Lighting fixtures shall be provided in accordance with the schedules. The fixtures shall be complete with all accessories necessary for a complete and proper installation. Catalog numbers indicated in schedules do not necessarily include plaster frame special mounting and other fittings which may be required for proper installation, but these devices shall be provided where applicable.
- B. All fluorescent light fixtures shall have lamps and ballasts as follows:
 1. Lamps to be energy saving C.W. as follows:
 - a. Trimline by G.E.
 - b. Octron by Sylvania
 - c. TL 70 by Phillips
 2. Ballasts to be compatible to above lamps as follows:
 - a. Sylvania Quicktronic Ballast

- b. Triad by G.E.
- c. Mark III by Advance

C. All incandescent lamps shall be 130 volt general service type by either General Electric, Westinghouse or Sylvania.

3. EXECUTION

3.1 PLANS AND SPECIFICATIONS

A. Plans, in general, are diagrammatic and Contractor shall coordinate his work, in advance, with that of the other trades to prevent installation conflict. Electrical Drawings shall not be scaled. Architect will be notified immediately of impending conflict, and work in question is not to be installed until Architect has resolved conflict.

3.2 INSTALLATION

- A. All fasteners, channels, angles and other members required for support of finished installation of electrical work shall be furnished and installed under this section of the specifications.
- B. All metallic, non-current carrying components of the electrical systems, including boxes, enclosures, raceways, etc., shall be securely bonded to an approved ground as per N.E.C.

B.1 HVAC WIRING

The electrical disconnect switches, conduit and wire shown on plans are sized as per the manufacturer and model number listed on the mechanical plans. If there is an equal, or complete substitution of A/C manufacturer provided, the mechanical/general contractor shall bear any additional cost incurred, if the electrical specifications are not equal.

C. Raceways

1. Raceways shall be concealed in floor slabs, walls, or above finished ceilings except where specifically noted on plans.
2. Conduit sizes shall be in strict accordance with National Electrical Code allowances on percentage fill unless specifically noted on plans.
3. Electric Metallic Tubing (EMT) shall not be installed in slab or below grade, or in locations else where specified as requiring rigid steel conduit materials. EMT shall not be installed for wiring to "vapor tight" or explosion-proof equipment or within concrete light standard bases. EMT shall be allowed in concealed walls and above finished ceiling.
4. Rigid steel or Schedule 40 PVC conduit shall be installed below finished grade and in or below concrete slabs. Where rigid steel is used, it shall be completely coated with an alkali and rust-resistant bitumastic paint, Sherwin Williams "Tar Guard", and threads shall be coated with zinc chromate. Rigid steel shall also be used when conduit is exposed to exterior environment such as exterior of building or where it is subject to damage.
5. Rigid steel conduit installed below grade shall be completely coated with an alkali and rust resistant bitumastic paint, Sherwin Williams "Tar Guard."
6. All PVC conduit larger than two inches (2") shall have rigid galvanized steel elbows.
7. Raceways shall be labeled with a permanent marker indicating circuits of system wiring they contain.
8. In general, raceways shall be run in straight lines with a minimum number of bends and offsets between junction outlet boxes. Exposed conduit, where permitted, shall be neatly installed in straight lines parallel with partitions and vertical construction features. All conduits shall be secured in accordance with N.E.C. requirements.

9. Terminations of all conduit runs shall be capped during construction to prevent intrusion of construction debris.

D. Outlet Boxes

1. Individual outlet boxes shall be selected for compatibility with construction materials involved. In general, depth of box shall be sufficient to accept conduit entry without additional chipping or cutting of construction material.
2. Flush boxes shall be rigidly installed and plumb so that finished face of the box and device cover is flush with adjacent wall surface.
3. Mounting height, to center line of outlet boxes, shall be:
 - a. Light Switches - 48" above floor
 - b. Convenience Outlets - 18" above floor
 - c. Receptacle Over Counters - 8" above work surface
 - d. Fixed Appliance Outlets - 18" above floor
 - e. Telephone/Data Outlets - 18" above floor*(ALL HEIGHTS SHALL BE VERIFIED WITH ARCHITECT AND/OR OWNER PRIOR TO ROUGH-IN)*
4. In masonry walls, mounting heights listed above shall be adjusted so that top or bottom of box is aligned with nearest masonry joint when possible. Mounting heights listed above are handicap accessibility standards.
5. For exterior locations and areas subject to moisture or water, provide corrosion-resistant cast metal waterproof boxes as applicable. Boxes shall be of types, shapes and sizes required. They shall be gasketed and have threaded hubs and conduit. Box accessory materials shall match the box for the specific application.
6. Outlet boxes shall be labeled with a permanent marker indicating circuits or system wiring they contain.
7. Outlet boxes on opposite sides of a wall shall be mounted a minimum of 24 inches apart to centerline of boxes.

E. Wire and Cable

1. Conductors shall not be installed in a conduit run until that conduit run is complete and properly terminated with bushed connector.
2. Switch and receptacle conductors shall be terminated with at least 8" free conductor at outlet box for device connection. Home runs shall be terminated in panelboard enclosure with sufficient free conductor length to reach related branch circuit protective device without splicing.
3. Pulling lubricants shall be approved for use with particular type of insulation on conductors being installed.
4. Solderless, insulated, spring type pressure connectors (SCOTCHLOK) shall be used for all general wiring size #8 and smaller. Compression type connectors shall be used for wiring size #6 and larger. Special connectors, where required, shall be solderless type, properly sized for conductors joined, and be completely covered with self vulcanizing electrical tape.
5. Furnish code approved wiring in ceiling cavities forming air plenums.
6. Conductors shall be color coded as follows:

208V SYSTEM	480V SYSTEM	PHASE SEQUENCE
Neutral - White	Neutral - White	ABC, top to bottom,
Phase A - Black	Phase A - Brown	left to right, front to
Phase B - Red	Phase B - Orange	back
Phase C - Blue	Phase C - Yellow	
Grd.Con - Green	Grd.Con - Green	

F. Wiring Devices

1. Wiring devices shall be securely fastened in place, properly aligned and plumb.

2. Wiring devices installed prior to application of interior finishes, shall be covered with plastic paint guard or masking tape throughout the application process.
3. All standard receptacles shall be grounded by means of ground wire. Strap alone will not constitute an acceptable ground.
4. All electrical raceways shall be equipped with a ground conductor sized as required by N.E.C.
5. Device plates shall not be installed until all interior wall finishes are completed. Device plates shall be installed with all four edges of plate in continuous contact with adjacent wall surface.

G. Panelboards

1. Panelboards shall be mounted with their center lines approximately 5 feet, 6 inches above the finished floor, except that the highest breaker shall in no case be more than 6 feet, 6 inches above the finished floor.
2. Typewritten circuit index shall be affixed to inside surface of each panelboard door, clearly indicating area and type of load served by each branch circuit protective device, including spares.
3. Engraved, laminated plastic identification plates shall be furnished and installed in all panels. Plates shall indicate panel name, voltage and amperage. Plates shall be affixed to front of panels with sheet metal screws.

H. Lighting Fixtures

1. All lighting fixtures shall be installed, wired, adjusted, aligned and lamped under this section of specifications.
2. In areas where the reflected ceiling plan is shown, all work shall be in conformance with this plan. If the ceiling grid is installed other than shown on the electrical plan, it shall be the responsibility of the installer of the lighting fixtures to call this fact immediately to the attention of the Architect and Contractor, and work shall not proceed until the Architect's decision in the matter is obtained.
3. Lighting in equipment rooms and electric closets is diagrammatic, indicating type, quantity and general circuiting of fixtures. Modify locations and mounting to suit conditions, allowing clearances for equipment, piping and ductwork.
4. Plaster frames shall be provided for all recessed fixtures including those located in lath and plaster, gypsum board, and similar materials.
5. Provide fixture support bars spanning structural T-bar ceiling channels for surface mounting type fixtures. Support bars and fixtures shall allow vertical and horizontal positioning of the fixture.
6. Provide a proper ceiling grid hanger for fixtures that are ceiling mounted or suspended from exposed "T-Grid" ceilings. The grid hanger shall secure to the main support channels of the ceiling and have provisions for locking in place. Grid hangers shall accept stem canopy or surface fixtures.
7. Fixtures shall not be supported by outlet box cover screws alone. Provide additional structural support as required.
8. Contractor shall review architectural plans for light fixture placement in ceilings and ceiling tiles, and review HVAC plans for coordination with ceiling mounted diffusers.

3.3 GROUNDING

- A. Service and equipment ground conductors shall be copper with Type THWN insulation and installed in strict accordance with N.E.C. regulations. Bonding fittings used are to be U.L. listed and be compatible with metals used in system.
- B. A separate, green Type THWN copper ground conductor shall be run from ground lug of each grounded receptacle to an approved connection inside the enclosing steel outlet box. Device mounting screws shall not be considered an approved ground.
- C. A separate ground conductor shall be installed in every conduit and raceway and securely bonded in an approved grounding terminal at both ends of the run. The grounding conductor shall be sized in

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accordance with Table 250-95 of the N.E.C. Contractor shall size conduit to accommodate additional conductor.

END OF SECTION

SECTION 16236

EMERGENCY GENERATION SYSTEM - DIESEL

1. GENERAL

1.1 Requirements

- A. All applicable portions of Division 1 - General Requirements shall be considered as included with this section.

1.2 Codes

- A. The following are minimum requirements and shall govern, except that all local, state and/or federal codes and ordinances shall govern when their requirements are in excess hereof.

1.3 Description

- A. Furnish all materials, labor, equipment, service, etc., necessary and incidental for the installation of all alternate engine generator set - diesel fueled work as indicated on the drawings and as specified herein.

B. Section includes:

1. Diesel-fueled engine-generator set with integrally-mounted fuel tank.
2. Automatic transfer switch.
3. Weatherproof enclosure with built-in double walled, 300 gallon fuel tank, minimum.
4. Fuel tank gauging system providing 20%, 50% and 100% level indication for remote annunciator panel.
5. Main line circuit breaker, 400 ampere, three pole thermal magnetic trip. Refer to Section 16413, this specification for additional requirements.
6. Remote annunciator panel.

C. Related sections:

1. Section 16413 - Enclosed Transfer Switches.

1.4 Qualifications

- A. The system shall be completely assembled, tested and shipped by a manufacturer who is regularly engaged in the production of such equipment for a minimum period of ten years with supplier parts and service facilities locally available so there is one source of supply and one responsibility.

1.5 Ratings

- A. Voltage: 120/208 volts, 3 phase, 4 wire, 60 hertz.
- B. KW/KVA: As indicated on the drawings with 0.8 power factor at specified altitude.

1.6 References

- A. Furnish equipment meeting all applicable requirements of SAE, IEEE, NEMA, NFPA and ANSI Standards.

1.7 Quality Assurance

- A. Furnish essentially standard products of manufacturers regularly engaged in the production of such equipment.
- B. Source Quality Control: Perform all normally factor tests including maximum and continuous net brake horsepower over the operating speed range, with the proposed engine fully equipped with required accessories.
1. Factory tests shall be performed at rated load (KW) and power factor. The use of resistive load banks without inductive loads is not acceptable.

The tests shall include but not necessarily be limited to the following:

- a. Single step load pick-up per NFPA 76A.
- b. Transient response and steady state governing.
- c. Alternator temperature rise by resistance method.
- d. Functional compatibility between generator set controls transfer switch controls (start, transfer, retransfer, stop with all time delays).
- e. Fuel consumption.
- f. Operation of remote derangement panel.

1.8 Maintenance

- A. Maintenance Data and Operating Instructions: Furnish to the owner two sets of instruction manuals covering complete operating, service, and repair instructions for the equipment furnished, and complete illustrated parts breakdown with manufacturer's name, nomenclature and part number for each component part and assembly. Include current unit prices for parts and supplies with location of nearest source of supply and service.
- B. Special Tools: Furnish to the Owner a complete set of all special tools required to operate and service the equipment as recommended by the manufacturer for field maintenance.
- C. Spare Parts: Provide the following:
 1. One oil filter replaceable element.
 2. One air filter replaceable element.
- D. Engineering Field Service: Require the manufacturer of the generator set to provide a qualified erection engineer to check the complete equipment after all equipment is installed and wired including setting, alignment, field connections, testing and start-up. Furnish to the Owner the manufacturer's written certification assuring that each item of equipment is complete, in good condition, free from damage, and properly installed, connected and adjusted. Require the manufacturer's engineer to make any electrical or mechanical adjustments or replacements which may be necessary to insure the proper functioning of the equipment furnished and to instruct the Owner's personnel in operation and maintenance of the equipment.

1.9 Warranty

- A. This contractor shall warrant all materials and workmanship. See Division 1 of the Specifications.

2. PRODUCTS

2.1 Approved Manufacturers

- A. Manufacturer: Provide engine-generator products of one of the following:
 1. Kohler.
 2. Cummins/Onan.
 3. Caterpillar.
 4. Katolight/Simpower

2.2 Engine

- A. The engine shall be liquid-cooled, 4 cycle, full compression ignition, single acting, vertical or V-type. The maximum horsepower output capacity at 1800 RPM, as certified by the engine manufacturer, shall be not less than 125 percent of the required BHP to assure operation at the specified altitude and ambient conditions.
- B. Engine shall operate on ASTM No. 2 fuel oil and shall be equipped with easily replaceable fuel filter elements. Furnish and install electric solenoid valve in fuel suction line.

- C. Engine shall be equipped with an electrical starting system sized to crank at a speed which will start the engine under operating conditions specified.
- D. Furnish heavy duty lead acid storage batteries, of sufficient capacity to crank the engine for at least 30 seconds at firing speed in the ambient temperatures specified and with capacity from cranking the engine a minimum of three times. Furnish and install rack for battery installation, and connecting battery cables. Batteries shall be rated for 12 or 24 volt DC output as required.
- E. Engine shall be equipped with an alternator to charge batteries when engine is operating.
- F. A battery charger shall be furnished to charge batteries to full capacity with engine is not operating. It shall be rated 120 volt, single phase input and 12 or 24 volts output as required. Charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell and provide no less than 5 amperes output.
- G. Cooling System:
 - 1. Engine shall be furnished with an engine-mounted radiator having sufficient capacity for cooling the engine when delivering full rated HP at 120 degrees ambient temperature.
 - 2. Engine shall be equipped with a centrifugal water pump for circulating water through the cooling system.
 - 3. Engine jacket water temperature shall be thermostatically controlled.
 - 4. Cooling system shall be filled with ethylene glycol antifreeze solution with corrosion-resistant additive as recommended.
 - 5. 120 volt, single phase package water heater shall be provided to keep water temperature above 21 degree C.
- H. Lubrication shall be provided by a gear-type lubrication oil pump. Effective full flow lubrication oil filters shall be provided and so located that lubricating oil is continuously filtered, except during periods when oil is bypassed to protect vital parts such as when filters are clogged. Replaceable resin impregnated cellulose type elements shall be accessible and easily removable.
- I. One or more engine-mounted dry type air cleaners of sufficient capacity to protect working parts of the engine from dust and grit shall be provided.
- J. An exhaust silencer shall be furnished to effectively minimize exhaust noise level and shall be equivalent in silencing qualities suitable for residential areas. A length of double wall stainless steel flexible exhaust pipe shall be provided at connection to engine. Furnish and install condensation trap on exhaust line and pipe to exterior of enclosure near bottom.
- K. Governor shall be isochronous type, capable of providing accurate speed control within 0.25 percent of rated speed.
- L. Engine shall be mounted on a structural steel subbase with vibration isolators.

2.3 Generator

- A. Generator shall be 3 phase, 4 wire, 60 hertz, at 1800 RPM, 120/208 volt operation, statically regulated controlled rectified type. Insulation on both rotor and stator shall be Class F with temperature rise per NEMA MG1-22.40 and shall be capable of operation at 125 percent of rated speed without injury. Neutral shall not be separately and solidly grounded in the field. All windings shall be copper.

- B. Static voltage regulator shall be included as an integral part of the generator exciter system.
 - C. Voltage level, voltage drop and voltage gain controls are to be provided, easily accessible for normal operating adjustments.
- 2.4 Control Panel
- A. Furnish and install a complete generator control panel consisting of generator protection devices, meters, lights and control devices as specified or required for proper operation.
 - B. Panel shall consist of the following:
 - 1. AC ammeter 0-300 A scale.
 - 2. AC voltmeter 0-600 V scale.
 - 3. Frequency meter.
 - 4. Ammeter/voltmeter phase selector switch (4 position).
 - 5. Emergency stop button.
 - 6. Running time meter.
 - 7. Furnish and install three (3) current and two (2) potential transformers. Potential transformers shall have primary and secondary sides properly fused.
 - 8. Individual fault lights for oil pressure, coolant temperature, overcrank and overspeed.
 - 9. Oil pressure and coolant temperature gauges.
 - 10. Cycle cranking with crank and rest periods adjustable from 0-30 seconds.
 - 11. Test-off-auto selector switch.
 - 12. 400 ampere, long time trip, main line, molded case circuit breaker.
 - C. Furnish and install remote engine-generator annunciator panel indicating unit status and alarms. To meet NFPA 100, annunciator shall duplicate generator control status and alarms, plus furnish high battery voltage (red), low battery voltage (red) and normal battery voltage (green). A separate light (red) must indicate battery charger malfunction. The position of auto transfer switch (source supplying power to load) shall be indicated. Furnish and install fuel level indicator (yellow) for 100% and 50% fill and red in combination with audible alarm for 20% fill.
- 2.5 Unit Mounting
- A. Complete unit shall be equipped with vibration isolators and mounted on a welded steel base, which shall provide suitable mounting to any level surface.
- 2.6 Housing
- A. Complete engine generator set shall be provided with a weatherproof steel housing. Housing shall be primed and finish painted. Housing shall meet the current wind code requirements for the area where unit is installed.
 - B. Housing shall be provided with hinged locking doors equipped with stainless steel piano hinges. Doors shall provide access to the entire unit.
 - C. Interior of housing shall be fully insulated using minimum 1-inch rigid board insulation glued and mechanically fastened in place. Inside face of insulation shall be furnished with foil covering. Joints shall be butted tight together and foil tape applied over joint.
 - D. Housing shall be provided with dampers, which open when unit starts. Dampers and openings shall be sized to provide required air flow for proper cooling. Dampers shall automatically close when unit stops.

- 2.7 Automatic Transfer Switch
 - A. Refer to section 16413 - Enclosed Transfer Switches.

3. EXECUTION

- 3.1 Placing in Service
 - A. This contractor shall obtain services of engine-generator set supplier for start-up and testing of completed installation. Furnish and install complete fill of required fluids and checkout all components for proper installation and operation. Furnish and install initial fill of fuel tank and refill fuel tank after testing.
 - B. Engine-generator set shall be tested on site after connection to site system. Unit shall be run under full load for minimum of 4 hours. Furnish and install required resistive load banks to use during test to fully load the unit. Readings of all meters shall be recorded each 30 minutes. Voltage and amperage shall be recorded for each phase. Five copies of tabulated data shall be provided for project closeout.
 - C. Furnish an optional deduct price for one (1) hour factory varying load test in conjunction with a one (1) hour site load test in lieu of the four (4) hour full load test.

END OF SECTION

SECTION 16413

ENCLOSED TRANSFER SWITCHES

1. GENERAL
 - 1.1 Requirements
 - A. All applicable portions of Division 1 - General Requirements shall be considered as included with this section.
 - 1.2 Codes
 - A. The following are minimum requirements and shall govern, except that all local, state and/or federal codes and ordinances shall govern when their requirements are in excess hereof.
 - 1.3 Description
 - A. Furnish all materials, labor, equipment, service, etc., necessary and incidental for the installation of an automatic transfer switch to provide source of emergency standby power as indicated on the drawings and as specified herein.
 - B. Section includes:
 1. Enclosed automatic load transfer switches.
 - 1.4 References
 - A. NEMA ICS 10 (National Electrical Manufacturers Association) - AC transfer Switch Equipment.
 - B. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Switches.
 - C. UL 1008 - Automatic Transfer Switches
 - D. ANSI/NFPA 99
 - 1.5 Submittals
 - A. Sections 01300 - Submittal Procedures: Submittal procedures.
 - B. Product Data: Submit catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.
 - 1.6 Closeout Submittals
 - A. Section 01700 - Execution Requirements: Closeout procedures.
 - B. Project Record Documents: Record actual locations of enclosed transfer switches.

- C. Operation and Maintenance Data: Submit routing preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.
- 1.7 Qualifications
 - A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience and with service facilities within 50 miles of project.
 - B. Supplier: Authorized distributor of specified manufacturer with minimum three (3) years experience.
- 1.8 Maintenance Service
 - A. Section 01700 - Execution Requirements: Maintenance services.
 - B. Provide service and maintenance of transfer switches for one year from date of Substantial Completion.
 - C. Include instructions for normal operation, routing maintenance requirements, and service manuals for emergency maintenance procedures.
- 1.9 Warranty
 - A. This contractor shall warrant all materials and workmanship. See Division 1 of the Specifications.
- 2. PRODUCTS
 - 2.1 Approved Manufacturers
 - A. Automatic Switch Company (ASCO)
 - B. Russelectric
 - C. Kohler
 - D. Onan
 - E. Caterpillar
 - 2.2 Product Description
 - A. NEMA ICS 10, automatic transfer switch suitable for use as service equipment.
 - 2.3 Automatic Load Transfer Switch with Maintenance Bypass Switch:
 - A. General:
 - 1. Provide an automatic load transfer switch, 3 pole, double throw type electrically-operated, mechanically-held, rated at amperes and withstand rating as specified on the drawings or sized to accommodate the rated output of the generator with 25% spare capacity at 600 volts AC for any type of load, inductive, tungsten or combined, conforming to the requirements of UL 1008, and housed in a NEMA 1 enclosure for remote wall mounting. Equip switches with a transfer coil operated by momentary energization from the source which the load is to be served after transfer takes place, and with heavy duty, replaceable, adjustable main contacts which positively lock on either source of power. Equip main contacts with separate arcing contacts, and do not provide a "neutral" or "off" position of the main contacts. Design the control circuitry to pilot the engine starting control to transfer load to the engine-generator set with the normal supply voltage in any phase drops below a predetermined value, adjustable from 65% to 90% normal, to retransfer the load to the normal source when the normal supply voltage is restored

to a predetermined value, adjustable from 90 to 100% normal for a predetermined time adjustable from 54 to 30 minutes, and to automatically stop the generator set after a 5 minute no-load run.

- B. Provide the following features and equipment in addition to those specified.
 - 1. Indication that the load is on the emergency source by an indicating light or other approved device.
 - 2. Prevent transfer of the load to the emergency source until voltage and frequency have reached at least 90% of the rated values by a voltage and frequency sensitive relay.
 - 3. Permit simulation of normal power failure without load transfer, by a maintained contact test switch.
 - 4. Permit manual retransfer of the load to the normal power source during the adjustable 5 to 30 minute delayed return transfer period by a momentary contact switch. Set retransfer time to 10 minutes.
 - 5. Permit the load to be served from the emergency source on a continuous basis, regardless of the suitability of the normal power source, by a maintained contact switch.
- C. Additional Features:
 - 1. Voltage monitoring of each phase of utility.
 - 2. Single phase monitoring of emergency source.
 - 3. Time delay to override momentary utility outages: 0-6 seconds adjustable (set at 1).
 - 4. Transfer to emergency time delay: 0-5 minutes adjustable (set at 0).
 - 5. Retransfer to utility time delay: 0-30 minutes adjustable (set at 10).
 - 6. Unloaded running time delay for generator cool-down: 0-30 minutes adjustable (set at 5).
 - 7. Two position selector switch ("test-auto").
 - 8. Exerciser clock to automatically start generator set at regular intervals under load conditions with optional load/no load switch.
 - 9. Pilot lights for normal (green) and emergency (red).

3. EXECUTION

3.1 Installation

- A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 16721

FIRE ALARM AND DETECTION SYSTEM

PART 1 – GENERAL

- A. General Conditions of the entire Specifications apply to work under this section.

1.1. SUMMARY

- A. This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.
- B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- C. The Fire Detection and Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
1. Fire alarm and detection operations
 2. Control and monitoring of elevators, smoke control equipment, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.

1.2. ACCEPTABLE MANUFACTURERS

- A. Manufacturers: The equipment and service described in this specification are those supplied and supported by SimplexGrinnell and represent the base bid for the equipment.
1. Subject to compliance with requirements, provide alternate products by one of the following:
 - a) SimplexGrinnell
 - b) Edwards Systems Technology
 - c) Notifier
- B. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.
- C. The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and NICET certified technicians, and shall maintain a service organization within 100 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signaling systems industry.

1.3. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and

Supplementary Conditions and Division 1 Specification Sections, apply to this section.

- B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:
 - 1. Division 16: "Basic Electrical Materials and Methods."
 - 2. Division 16: "Wiring Methods."
 - 3. Division 13: "Fire Suppression"
 - 4. Division 15: "Fire Protection"
 - 5. Division 15: "HVAC Systems"
- C. The system and all associated operations shall be in accordance with the following:
 - 1. Guidelines of the following Building Code: IBC
 - 2. NFPA 72, National Fire Alarm Code
 - 3. NFPA 70, National Electrical Code
 - 4. NFPA 101, Life Safety Code]
 - 5. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems
 - 6. Other applicable NFPA standards
 - 7. Local Jurisdictional Adopted Codes and Standards
 - 8. ADA Accessibility Guidelines

1.4. SYSTEM DESCRIPTION

- A. General: Provide a complete, non-coded, addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.
- B. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of 100% on-site programming to accommodate system expansion and facilitate changes in operation. All programming shall be capable of being accomplished via the front panel and via a lap top computer. All software operations shall be stored in a non-volatile programmable memory within the FACP. Loss of primary and secondary power shall not erase the instructions stored in memory.
- C. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. Separate alarm, supervisory and trouble logs shall be provided.
- D. Wiring/Signal Transmission:
 - 1. Transmission shall be addressable signal transmission, dedicated to fire alarm service only.
 - 2. System connections for initiating (signaling) circuits and notification appliance circuits shall be Class B.

3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.
- E. Remote Access:
1. FACP shall have the capability to provide Remote Access through a Dial-Up Service Modem using the public switched telephone system of a private switched telephone system.
 2. A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting and information gathering.
- F. Required Functions: The following are required system functions and operating features:
1. Priority of Signals: Alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Supervisory and Trouble events have second-, and third-level priority respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.
 2. Noninterfering: The activation of an addressable device does not prevent the receipt of signals from subsequent activations.
 3. Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to a remote central station service transmitter provided under another contract.
 4. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and any required remote annunciators, indicating the location and type of device.
 5. General Alarm: A system general alarm shall include:
 - a) Indication of alarm condition at the FACP and any required remote annunciator(s).
 - b) Identification of the device that is the source of the alarm at the FACP and any required remote annunciator(s).
 - c) Operation of audible and visible notification appliances throughout the building until silenced. Audible Alarm Notification shall operate Temporal Code.
 - d) Closing doors normally held open by magnetic door holders.
 - e) Unlocking designated doors.
 - f) Shutting down supply and return fans serving zone where alarm is initiated.
 - g) Closing smoke dampers on system serving zone where alarm is initiated.
 - h) Initiation of smoke control sequence through the building temperature control system.
 - i) Notifying the local fire department.
 - j) Initiation of elevator recall in accordance with ASME/ANSI A17.1,

when specified sensors are activated.]

6. Supervisory Operations: Upon activation of a supervisory device such as fire pump power failure, low air pressure switch, and tamper switch, the system shall operate as follows:
 - a) Activate the system supervisory service audible signal and illuminate the LED at the FACP and the graphic annunciator.
 - b) Pressing the Supervisory Acknowledge key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
 - c) Record the event in the FACP historical log.
 - d) Transmission of supervisory signal to remote central station.
7. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible alarm signals shall cease operation.
8. System Reset
 - a) The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-arming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
 - b) Should an alarm condition continue, the system will remain in an alarmed state.
9. Drill: A manual evacuation (drill) switch shall be provided to initiate an alarm on the FACP.
10. Manual Control: Manual controls shall be supervised so that an "off normal" position of any switch shall cause an "off normal" system trouble. The "off normal" status shall be clearly identified in plain-language on the FACP alphanumeric display.
 - a) Manual Bypass Control: The ability to perform a manual bypass of selected automatic functions shall be provided.
 - b) Circuit Enable/Disable Control: The system shall have provisions for disabling and enabling each circuit individually for maintenance or testing purposes.
11. WALKTEST: The system shall have a one person test feature. Enabling the one person test feature at the FACP shall activate the "One Person Testing" mode of the system as follows:
 - a) The city circuit connection and suppression release circuits shall be bypassed for the testing group.
 - b) Control relay functions associated to the testing group shall be bypassed.
 - c) The FACP shall indicate a trouble condition.
 - d) The alarm activation of any initiation device in the testing group shall cause the audible notification appliances to sound a code to identify the device.
 - e) The control panel shall automatically reset itself after signaling is

complete.

- f) Any momentary opening of an initiating or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

G. Analog Smoke Sensors:

1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The FACP shall determine the condition of each sensor by comparing the sensor value to the stored values.
2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 8 sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.
4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a Maintenance Terminal CRT Display or printed for annual recording and logging of the calibration maintenance schedule.
5. Peak Value Logging: The FACP shall log the Peak Value of smoke obscuration or degree of temperature for each individual sensor to allow system calibration for maximum response time performance without nuisance alarms based on "actual ambient conditions".
6. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to indicate that a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate that a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a dirty sensor without creating a trouble in the system. If this indicator is ignored, a second level "DIRTY SENSOR" condition shall be indicated at the FACP.. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control panel.
7. The FACP shall continuously perform an automatic self-test on each sensor which will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.

H. Fire Suppression Monitoring:

1. Water flow: Activation of a water flow switch shall initiate general alarm operations.
2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
3. WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall

distinctly report which device is in alarm on the initiating zone.

4. Suppression Release: The FACP shall be UL/ULC Listed and FM Approved for Automatic Suppression Release Service. The system shall be capable of protecting up to 10 hazards and shall include the following:
 - a) Compatible with FM Approved Automatic Water Control Valves Groups A, B, D, E, F, G, & H.
 - b) Secondary standby power for; 24 hours of standby with 5 minutes of alarm. Battery calculations shall be at 21 volts to ensure proper operation of the actuators on battery standby. Provide battery charts or calculations showing performance of such standby and alarm power.
 - c) Regulated Suppression Release power supply with dedicated power TAP(s) for suppression releasing circuits.
 - d) Addressable Suppression Release Peripheral (SRP) with addressable communications and conventional NAC inputs.
 - (a) The addressable Suppression Release Peripheral (SRP) shall employ positive dual-input control logic. The operation of the SRP's Releasing Appliance Circuit shall require an activation command from both the Addressable Communication Circuit and a Notification Appliance Circuit. If an activation command is only received from one input but not the other, an output abnormal trouble shall be reported to the FACP.
 - (b) Power to operate the SRP shall be supplied by the input Notification Appliance Circuit.
 - (c) The addressable suppression release peripheral shall have built-in regulation to accept input power from non-regulated NAC circuits.
 - (d) An enclosure shall be provided for mounting the SRP. The SRP enclosure cover shall be clearly marked Fire Releasing Device and shall allow for the mounting of an optional LED.
 - (e) An LED shall be supplied to provide a troubleshooting aid. The LED shall blink on poll whenever the peripheral is powered and communicating. The supplied LED shall be mounted to the SRP enclosure cover.
 - e) Audible alarm notification shall provide automatic audible escalation of events and shall operate:
 - (a) Temporal Code to notify first cross-zone alarm
 - (b) Fast March Time to notify the release timer is active (running), and

- (c) Steady to notify the release function has activated.
 - f) Class B, Releasing Appliance Circuits (RACs) rated for 1 Amp max @ 24VDC for control of compatible actuators for releasing device service.
 - g) RAC wiring shall be supervised for open circuit wiring faults and actuator coil continuity.
 - h) RAC wiring shall be supervised for short circuit wiring faults between the FACP and the actuator junction box.
 - i) Service disconnect switch(es), system abort switch(es), manual release station(s) and all other accessories, as required.
 - j) Programmable operation for either non cross-zone operation or cross-zone operation that requires the activation of two automatic detector zones in the hazard area for initiation of the automatic release operation.
 - k) Releasing Appliance Circuit manual alarm delay timer, programmable from 0 - 30 seconds in one-second increments.
 - l) Releasing Appliance Circuit automatic alarm delay timer, programmable from 0 - 60 seconds in one-second increments.
 - m) Releasing Appliance Circuit soak timer, programmable from 0 - 40 minutes in one-second increments.
 - n) Five Programmable Abort Options; Immediate Release, 10 Second Delay, IRI Abort, NY City Abort, or Reset Original RAC Delay Timer.
 - o) Depleted Battery Cutout operation. On the detection of a depleted battery condition system shall be programmable to cutout or disable activation of all notification appliance circuits and releasing appliance circuits.
- I. Audible Alarm Notification: By horns in areas as indicated on drawings.
- J. Power Requirements
- 1. The control panel shall receive AC power via a dedicated fused disconnect circuit.
 - 2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
 - 3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control panel.
 - 4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control panel. A green "power on" LED shall be displayed continuously while incoming power is present.
 - 5. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be indicated at the control panel.
 - 6. The system shall support 100% of addressable devices in alarm operated at

the same time, under both primary(AC) and secondary (battery) power conditions.

7. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.5. SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
 1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
 2. Wiring diagrams from manufacturer.
 3. Shop drawings showing system details including location of FACP, all devices, circuiting and details of graphic annunciator.
 4. System Power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per required standards.
 5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of SLC, NAC, RAC, Sensor, and auxiliary control circuits.
 6. Operating instructions for FACP.
 7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.
 8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
 9. Record of field tests of system.
- B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications or revisions to obtain approval.

1.6. QUALITY ASSURANCE

- A. Installer Qualifications: A factory authorized installer is to perform the work of this section.
- B. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

1.7. MAINTENANCE SERVICE

- A. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months, using factory-authorized service representatives.
- B. Basic Services: Systematic, routine maintenance visits on a semi-annual basis at times scheduled with the Owner. In addition, respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.
- C. Additional Services: Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing. Compensation for additional services must be agreed upon in writing prior to performing services.
- D. Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the maintenance services contract, deliver to the Owner a proposal to provide contract maintenance and repair services for an additional one-year term. Owner will be under no obligation to accept maintenance service contract renewal proposal.

1.8. EXTRA MATERIALS

- A. General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:
 - 1. Break Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.
 - 2. Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.
 - 3. Smoke Sensors, Fire Detectors, and Flame Detectors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.
 - 4. Sensor Bases: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than one of each type.

PART 2 – PRODUCTS

2.1. FIRE ALARM CONTROL PANEL (FACP)

- A. General: Comply with UL 864, "Control Panels for Fire-Protective Signaling Systems."
- B. The following FACP hardware shall be provided:
 - 1. Power Limited base panel with beige cabinet and door, 120 VAC, 60 HZ input power.
 - 2. Four (4) Class B/Style Y Notification Appliance Circuits (NAC; rated 2A @ 24VDC, resistive);
 - 3. Two form "C" Auxiliary Output Circuits (rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory or other selective control operations. Provide capability for switching up to ½ A @ 120VAC,

inductive loads.

4. Dual Municipal City Circuit Connection for connection to either 24VDC Remote Station (reverse polarity) or local energy.
 5. The FACP shall support two (2) RS-232-C ports.
 6. Supervised serial communication channel for control and monitoring of remotely located LCD annunciator and I/O panels.
 7. Common Event DACT.
- C. Cabinet: Lockable steel enclosure. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single panel is required to form a complete control panel, provide exactly matching modular panel enclosures.
- D. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

2.2. REMOTE MAINTENANCE TERMINAL (CRT) AND PRINTERS

- A. Fire Alarm Control Panel shall be capable of operating a remote maintenance terminal and/or printers; output shall be ASCII from an RS-232-C connection with an adjustable baud rate.
- B. The FACP shall be capable of supporting and supervising as many as two (2) printers, or (1) maintenance terminal and (1) printer.

2.3. REMOTE LCD ANNUNCIATOR

- A. Provide Remote LCD Annunciator(s) as required with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs and LCD Display as the FACP.
- B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with three (3) programmable LEDs (two selectable as red or yellow; one selectable as green or yellow).
- C. Under normal conditions the LCD shall display a "SYSTEM IS NORMAL" message and the current time and date.
- D. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
- E. The LCD shall display the following information relative to the abnormal condition of a point in the system:
1. 40 character custom location label.
 2. Type of device (e.g., smoke, pull station, water flow).
 3. Point status (e.g., alarm, trouble).
- F. Operator keys shall be key switch enabled to prevent unauthorized use. The key

shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

2.4. EMERGENCY POWER SUPPLY

- A. General: Components include battery, charger, and an automatic transfer switch.
- B. Battery: Sealed lead-acid type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all notification appliances in alarm or supervisory mode for a period of 5 minutes.

2.5. ADDRESSABLE MANUAL PULL STATIONS

- A. Description: Addressable single- or double-action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.
- B. Protective Shield: Where required provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.

2.6. SMOKE SENSORS

- A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
 - 1. Factory Nameplate: Serial number and type identification.
 - 2. Operating Voltage: 24 VDC, nominal.
 - 3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
 - 4. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.
 - 5. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
 - 6. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
 - 7. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall

indicate a "Wrong Device" trouble condition.

8. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
 9. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
 10. Removal of the sensor head for cleaning shall not require the setting of addresses.
- B. Type: Smoke sensors shall be of the photoelectric or combination photoelectric / heat type. Where acceptable per manufacturer specifications, ionization type sensors may be used.
- C. Bases: Relay output, sounder and isolator bases shall be supported alternatives to the standard base.
- D. Duct Smoke Sensor: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.
1. Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct sensor shall be provided by the FACP.
 2. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.
 3. Duct Housing shall provide a relay control trouble indicator Yellow LED.
 4. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
 5. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
 6. Duct Housing shall provide a magnetic test area and Red sensor status LED.
 7. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
 8. Each duct sensor shall have a Remote Test Station with an alarm LED and test switch.
 9. A NEMA 4X weatherproof duct housing enclosure shall provide for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

2.7. HEAT SENSORS

- A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as

indicated.

- B. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.
- C. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and] programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.
- D. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

2.8. VERY EARLY SMOKE DETECTION SYSTEM

- A. The Detector, Filter, and Aspirator shall be housed in an enclosure and shall be arranged in such a way that air is drawn from the fire risk and a sample passed through the Dual Stage Filter and Detector by the Aspirator
- B. The detector shall be individually addressable and connect directly to the addressable signaling line circuit without the use of interfaces. The detector shall utilize the same address-setting method as other addressable devices on the system.
- C. The detector shall have a red status LED that will flash each time the detector is scanned by the Control Unit (once every 4 seconds). In alarm condition, the LED shall be on steady.
- D. The detector shall have a single pipe inlet, which must contain a flow sensor. Both Minor and Urgent flow faults for both high and low shall be reported at the detector.
- E. The filter must be a two-stage disposable filter cartridge. The first stage shall be capable of filtering particles in excess of 20 microns from the air sample. The second stage shall be ultra- fine, removing more than 99% of contaminant particles of 0.3microns or larger, to provide a clean air barrier around the detector's optics to prevent contamination and increase service life.
- F. The aspirator shall be a purpose-designed rotary vane air pump. It shall be capable of supporting a single pipe run of 150 ft, or two or three pipe runs, with a transport time of less than 60 seconds or as appropriate codes dictate.
- G. The detector shall be capable of driving a remote LED indicator.
- H. When required, programming shall be performed using a Windows® application running on a PC. Said application shall support the following features at a minimum:
 - 1. Viewing of all status information of connected device.
 - 2. Graphing of smoke trend information.
 - 3. Multi-level password control.
 - 4. Programmable high and low flow settings for airflow supervision.

5. Programmable maintenance intervals.
 - I. A digital communication port shall comply with EIA RS232 Protocol.
 - J. The system shall be powered from a regulated supply of nominally 24V DC. The battery charger and battery shall comply with the relevant Codes, Standards or Regulations. Typically 24 hours standby battery back up is required followed by 30 minutes in an alarm condition.
 - K. Local Power Supply Standards that may apply: UL 1481 Listed (provided the power supply and standby batteries have been appropriately sized/rated to accommodate the system's power requirements).
 - L. The detector shall provide a supervised input circuit with which the remote power supply trouble contact may be monitored. Activation of power supply trouble output contact shall cause detector to transmit power supply trouble status information to the attached control panel. A 47 K ohm E.O.L. resistor shall be used for monitoring circuit purposes.

2.9. ADDRESSABLE CIRCUIT INTERFACE MODULES

- A. Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of water flow, valve tamper, non-addressable devices, and for control of evacuation indicating appliances and AHU systems.
- B. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two wire pair running from an appropriate power supply as required.
- C. There shall be the following types of modules:
 1. Type 1: Monitor Circuit Interface Module:
 - a) For conventional 2-wire smoke detector and/or contact device monitoring with Class B or Class A wiring supervision. The supervision of the zone wiring will be Class B. This module will communicate status (normal, alarm, trouble) to the FACP.
 - b) For conventional 4-wire smoke detector with Class B wiring supervision. The module will provide detector reset capability and over-current power protection for the 4-wire detector. This module will communicate status (normal, alarm, trouble) to the FACP.
 2. Type 2: Line Powered Monitor Circuit Interface Module
 - a) This type of module is an individually addressable module that has both its power and its communications supplied by the two wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall have the capability of communicating four zone status conditions (normal, alarm, current limited, trouble) to the FACP.

- b) This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices. The module shall communicate four zone status conditions (open, normal, abnormal, and short). The two-wire signaling line circuit shall supply power and communications to the module.

3. Type 3: Single Address Multi-Point Interface Modules

- a) This multipoint module shall provide location specific addressability for four initiating circuits and control two output relays from a single address. Inputs shall provide supervised monitoring of normally open, dry contacts and be capable of communicating four zone status conditions (normal, open, current limited, and short). The input circuits and output relay operation shall be controlled independently and disabled separately.
- b) This dual point module shall provide a supervised multi-state input and a relay output, using a single address. The input shall provide supervised monitoring of two normally open, dry contacts with a single point and be capable of communicating four zone status conditions (normal, open, current limited, and short). The two-wire signaling line circuit shall supply power and communications to the module.
- c) This dual point module shall monitor an unsupervised normally open, dry contact with one point and control an output relay with the other point, using a single address. The two-wire signaling line circuit shall supply power and communications to the module.

4. Type 4: Line Powered Control Circuit Interface Module

- a) This module shall provide control and status tracking of a Form "C" contact. The two-wire signaling line circuit shall supply power and communications to the module.

5. Type 5: 4-20 mA Analog Monitor Circuit Interface Module

- a) This module shall communicate the status of a compatible 4-20 mA sensor to the FACP. The FACP shall annunciate up to three threshold levels, each with custom action message; display and archive actual sensor analog levels; and permit sensor calibration date recording.

- D. All Circuit Interface Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

2.10. ADDRESSABLE ALARM NOTIFICATION APPLIANCES

- A. Addressable Notification Appliances: The Contractor shall furnish and install Addressable Notification Appliances and accessories to operate on compatible signaling line circuits (SLC).

1. Addressable Notification appliance operation shall provide power, supervision and separate control of horns and strobes over a single pair of wires. The controlling channel (SLC) digitally communicates with each appliance and receives a response to verify the appliance's presence on the channel. The channel provides a digital command to control appliance operation. SLC channel wiring shall be unshielded twisted pair (UTP), with a capacitance rating of less than 60pf/ft and a minimum 3 twists (turns) per foot.
 2. Class B (Style 4) notification appliances shall be wired without requiring traditional in/out wiring methods; addressable "T" Tapping shall be permitted. Up to 63 appliances can be supported on a single channel.
 3. Each Addressable notification appliance shall contain an electronic module and a selectable address setting to allow it to occupy a unique location on the channel. This on-board module shall also allow the channel to perform appliance diagnostics that assist with installation and subsequent test operations. A visible LED on each appliance shall provide verification of communications and shall flash with the appliances address setting when locally requested using a magnetic test tool.
- B. Addressable Controller: Addressable Controller shall supervise Channel (SLC) wiring, communicate with and control addressable notification appliances. It shall be possible to program the High/Lo setting of the audible (horn) appliances by channel from the addressable controller.
- C. Horn: Addressable horn shall be listed to UL 464. Horn appliances shall have a High/Lo Setting, programmable by channel from the addressable controller or by appliance from the host FACP. The horn shall have a minimum sound pressure level of 83 or 89 dBA @ 24VDC. The horn shall mount directly to a standard single gang, double gang or 4" square electrical box, without the use of special adapter or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot.
- D. Visible/Only: Addressable strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.
- E. Audible/Visible: Addressable combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 83 or 89 dBA @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. The appliance shall be capable of two-wire synchronization with one of the following options:
1. Synchronized Strobe with Horn on steady
 2. Synchronized Strobe with Temporal Code Pattern on Horn
 3. Synchronized Strobe with March Time cadence on Horn

4. Synchronized Strobe firing to NAC sync signal with Horn silenced
- F. Isolator Module: Isolator module provides short circuit isolation for addressable notification appliance SLC wiring. Isolator shall be listed to UL 864. The Isolator shall mount directly to a minimum 2 1/8" deep, standard 4" square electrical box, without the use of special adapter or trim rings. Power and communications shall be supplied by the Addressable Controller channel SLC; dual port design shall accept communications and power from either port and shall automatically isolate one port from the other when a short circuit occurs. The following functionality shall be included in the Isolator module:
 1. Report faults to the host FACP.
 2. On-board Yellow LED provides module status.
 3. After the wiring fault is repaired, the Isolator modules shall test the lines and automatically restore the connection.
 - G. Accessories: The contractor shall furnish the necessary accessories.

2.11. STANDARD ALARM NOTIFICATION APPLIANCES

- A. Horn: Piezoelectric type horn shall be listed to UL 464. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The horn shall mount directly to a standard single gang, double gang or 4" square electrical box, without the use of special adapter or trim rings.
- B. Visible/Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.
- C. Audible/Visible: Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings.
- D. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a Temporal Code Pattern operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.
- E. Accessories: The contractor shall furnish the necessary accessories.

PART 3 – EXECUTION

3.1. INSTALLATION, GENERAL

- A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

- B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
 - 1. Factory trained and certified personnel.
 - 2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
 - 3. Personnel licensed or certified by state or local authority.

3.2. EQUIPMENT INSTALLATION

- A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.
- B. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.
- C. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

3.3. WIRING INSTALLATION

- A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AH) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
- B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

3.4. FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
 - 1. Factory trained and certified.
 - 2. National Institute for Certification in Engineering Technologies (NICET) fire

alarm certified.

3. International Municipal Signal Association (IMSA) fire alarm certified.
 4. Certified by a state or local authority.
 5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
- C. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
- D. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
- E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.
- F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
- H. Final Test, Certificate of Completion, and Certificate of Occupancy:
1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

3.5. CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.
- B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.6. TRAINING

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
 2. Schedule training with the Owner at least seven days in advance.

END OF SECTION

