00 01 10 - TABLE OF CONTENTS

09 96 00	High Performance Coatings	GBS

Division 10 - Specialties

10 40 00	Signage	GBS
10 44 00	Fire Protection Specialties semi-recessed	GBS
~~10 82 13~~	~~Roof Screens~~	~~GBS~~

Division 11 - Equipment

11 13 00	Planetarium Lifter Assembly	GBS
11 52 13	Projection Dome Screen Installation	GBS
11 55 16	Planetarium Pendulums	GBS
11 61 43	Stage Curtains	GBS

Division 12 - Furnishings

12 61 00	Fixed Planetarium Seating	GBS

Division 13 - Special Construction
Not Used

Division 14 - Conveying System
Not Used

Divisions 15 – 20
Not Used

Divisions 21 - Fire Suppression
Not Used

Division 22 – Plumbing

22 00 50	Basic Plumbing Materials and Methods	CEC
22 10 00	Plumbing Piping Systems	CEC

Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)

23 00 50	Basic (HVAC) Materials and Methods	CEC
23 05 93	Testing, Adjusting, and Balancing for HVAC	CEC
23 08 00	Commissioning of HVAC	WVC
23 09 00	Building Management System	CEC
23 80 00	Heating, Ventilating and Air Conditioning	CEC
23 80 50	Packaged Rooftop Air Conditioning	CEC

Divisions 24 & 25
Not Used

Division 26 – Electrical

26 01 00	Electrical Basic Requirements	WHM
26 05 00	Materials and Methods	WHM
26 05 19	Conductors and Cables	WHM
26 05 26	Grounding and Bonding	WHM
26 05 29	Seismic For Electrical	WHM
26 08 00	Commissioning of Electrical	WVC
26 13 00	Raceways and Boxes	WHM
26 24 20	Panelboards	WHM
26 27 00	Transformers	WHM

26 27 26	Wiring Devices	WHM
26 28 16	Enclosed Switches and Circuit Breakers	WHM
26 51 00	Interior Lighting	WHM
26 53 10	Exhibit Lighting System	WHM
26 55 00	Cove Lighting System	WHM
26 56 00	Exterior Lighting	WHM

Divisions 27 – Communications

27 00 01	Communications	CMS
27 05 26	Communications Grounding and Bonding	CMS
27 05 36	Communication Cable Pathways	CMS
27 08 10	Optical Fiber Testing and Measurements	CMS
27 08 20	Copper Testing	CMS
27 11 00	Communications Equipment Rooms Fitting	CMS
27 13 00	Communications Backbone Cabling	CMS
27 15 00	Communications Horizontal Cabling	CMS
27 16 00	Communications Connecting Cords and Adapters	CMS
27 14 16	Audio Visual Equipment (Includes ALS System) TO BE BID IN A SEPARATE PACKAGE	CMS

Division 28 - Electronic Safety and Security

28 00 00	General Security System Requirements	CMS
28 05 13	Security Systems Cabling	CMS
28 05 53	Security System Labeling	CMS
28 13 00	Access Control & Alarm Monitoring System	CMS
28 23 00	Video Surveillance System	CMS
28 31 00	Fire Alarm System	WHM

Divisions 29 to 30
Not Used

Division 31 – Earthwork

31 23 00	Excavation and Fill	BFK
31 23 33	Utility Trenching and Backfilling	BFK
31 25 00	Erosion and Sedimentation Control	BFK

Division 32 - Exterior Improvements

32 05 23	Portland Cement Concrete (Site)	BFK
32 11 23	Aggregate Base Course	BFK
32 12 43	Grasscrete Pavers	GBS

Division 33 – Utilities

33 11 66	Water Distribution System	BFK
33 31 00	Sanitary Sewerage System	BFK
33 41 00	Storm Drainage System	BKF
33 46 00	Subdrainage	BFK

Divisions 34 - 48
Not Used

ACRONYMS

AA	Assa Abloy (Door Hardware)
BKF	BKF Engineers (Civil)
CEC	Capital Engineering Consultants, Inc. (Mech & Plumb)
CMS	Charles M. Salter Associates (Acoustics, AV, Telecom& Security)
EFI	Environmental Foresight Inc. (Landscape)
GBS	Gary Barnett Specifications
KPFF	KPFF Consulting Engineers (Structural)
WHM	WHM Inc. (Electrical)

END OF TABLE OF CONTENTS

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes:
   1. Work covered by the Contract Documents.
   2. Type of Contract.
   3. Work phases.
   4. Work under other contracts.
   5. Products ordered in advance.
   6. Owner-furnished products.
   7. Use of premises.
   8. Owner's occupancy requirements.
   9. Work restrictions.

B. Related Sections include:
   1. Section 01 27 50 "Allowances" for descriptions and procedures on the use of allowances. (IF APPLICABLE)
   2. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Kvamme Planetarium Addition
14000 Fruitvale Avenue
Saratoga, CA 95070

B. Owner: West Valley-Mission Community College District
14000 Fruitvale Avenue
Saratoga, CA 95070

C. Architect: tBP/Architecture
1777 Oakland Boulevard, Suite 320
Walnut Creek, CA 94596

D. Construction Manager: Deedee Flauding
Gilbane Building Company
1798 Technology Drive, Suite 120
San Jose, CA 95110
dflauding@gilbaneco.com

The Construction Manager has been engaged for this project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and Contractor, according to a separate contract between Owner and Construction Manager.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work consists and includes but is not limited to:
Furnish all labor, materials, equipment and services as required to satisfactorily complete all Work required for the construction and completion of the Kvamme Planetarium Addition as defined below and in accordance with the Drawings and Specifications provided for This Contract.

1. Specific Work Scope
   a. Construction of Planetarium building, including installation of Owner-furnished planetarium dome.
   b. Infrastructure and equipment as noted for audio-visual, telecommunications, and security.
   c. Landscape, hardscape, and seat walls adjacent to the building.

2. Alternates:
   a. Additive Alternate #1: Provide a cost for the "Ulteria Seam" seaming process for the Planetarium Dome projection screen. Refer to Specification 11 52 13.
   b. Additive Alternate #2: Roof Observatory Enclosure – Provide a cost for an 18' Enclosure (200" base diameter) by **Astro Haven Enterprises** along with the assembly and complete installation of the enclosure on the Planetarium building roof. Include associated items and equipment: access door in enclosure base, split-system AC unit (keynotes 18, 19, and 20 on A-3.0) and required power.

3. Milestone Dates

Board Approval of Contract Award	November 15, 2016
Notice to Proceed	(Estimated) ~~(DATE TBD)~~November 22, 2016

1.5 TYPE OF CONTRACT

A. Project will be constructed under a single-prime contract arrangement.

1.6 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with Owner's separate contractors so work on those contracts may be carried out smoothly, without interfering or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
   1. Various other Projects on the West Valley College Campus

1.7 OWNER-FURNISHED PRODUCTS

A. Planetarium Dome by Astro-Tec Manufacturing, Inc

1.8 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as directed by the Owner and as shown on the drawings.
B. Use of Site: Limit use of premises to areas within Contract limits. Do not disturb portions of Project site beyond areas in which the "Allowed Work Areas" are indicated.
C. Provide for emergency vehicles at all times.
D. This Contractor shall utilize chain link fencing, traffic control and signage around all site work during construction at ALL TIMES for the safety of WVC staff and students. Contractor shall assume that Campus access roads must remain open and operating at all times during This Contractor's Work activities.
E. Limits: Allow for Owner occupancy of Project site.
    1. Access Roads, Driveways, Entrances, and Pedestrian pathways: Keep driveways, parking areas, loading areas, entrances, and pedestrian pathways serving premises as clear as construction operations will allow. Remove temporary fencing and clean work areas as soon as work areas are completed.
    2. Temporary storage of materials will be allowed on a case-by-case basis. Contractor will be allocated a designated area on Campus for site utilization, storage, and parking.
        a. Schedule deliveries to minimize use of driveways and entrances.
        b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
F. Do not unreasonably encumber site with materials or equipment. Confine stockpiling of materials and location of storage areas to areas as directed by Owner.
G. Smoking or open fires are prohibited on campus.

1.9 OWNER'S OCCUPANCY REQUIREMENTS

A. Partial Owner Occupancy: Owner will occupy the campus during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform Work so as not to interfere with Owner's operations. Maintain existing exits, vehicular routes, and pedestrian paths, unless otherwise indicated.
    1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
    2. Provide not less than five working days notice to Owner of activities that will affect Owner's operations. Coordinate with Construction Manager for advance notice of construction and impediments to the Campus operations.

B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and use the completed areas of site, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Engineer will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
3. Before partial Owner occupancy, utility, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of the campus.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of the campus.

1.10 WORK RESTRICTIONS

A. On-Site Work Hours: The construction hours / days of Work at the Site are 7:30 am to 6:00 pm Monday through Friday. Saturday construction hours are 9:00 am to 5:00 pm and special circumstances Saturday work must be pre-approved by the District in writing coordinated with and by the Construction Manager. Work is prohibited on Sundays and weekday holidays.

B. Owner's academic calendar is available on-line and reflects the critical dates for campus activities such as the start of each session and the final exam dates. Contractor shall note that at the start of each session, the number of students and vehicles are at the peak.

C. During the academic school year, the Owner has programs other than the academic session. Some of these programs include, but are not limited to: The Farmers Market; Dance Recitals, Theater Programs, Sports Camps, and Sports Programs.

D. Contractor shall cooperate and coordinate with Construction Manager to minimize the impact of construction on the campus with school and other program activities.

E. Do not perform the following types of work until written agreement as to allowable times has been obtained from Owner:
   1. Work involving utility shutdowns.
   2. Core drilling or other noisy activity.

F. Construction Notifications shall be given as follows. Contractor shall not proceed with the work or with shutdowns or interruptions until authorized by the Construction Manager in writing:
   1. This Work is anticipated to involve daily operations in and around Campus access roadways and pedestrian pathways. Contractor shall be required to update Construction Manager no less than each (3) days for areas of work so that proper Construction Notices may be posted for District and Campus staff and students in advance of construction activities.
   2. For electrical power shutdowns anticipated to be less than 1 hour, provide written notice to the Construction Manager a minimum of three (3) work days in advance.
   3. For electrical power shutdowns anticipated to be in excess of 1 hour, provide written notice to the Construction Manager a minimum of fourteen (14) work days in advance.

4. For domestic water and gas shut-offs, provide written notice to the Construction Manager a minimum of three (3) work days in advance.
5. For interruptions of low voltage systems such as fire alarm, communication, clock, signal, data and energy management systems, provide written notice to the Construction Manager a minimum of three (3) work days in advance.
6. For high impact activities including but not limited to crane operations, concrete pours, large special deliveries; traffic and road impacts, provide written notice to the Construction Manager a minimum of three (3) work days in advance.

PRODUCTS (Not Used)

PART 2 - EXECUTION

2.1 SCHEDULE OF OWNER-FURNISHED PRODUCTS

1. Planetarium Dome by Astro-Tec Manufacturing, Inc.

END OF SECTION 01 11 00

SECTION 01 25 11

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements and procedures for requests for substitution of products.

1.2 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 60 00 – Product Requirements and Substitutions.

1.3 LIMITATIONS ON SUBSTITUTIONS

A. Requests for substitutions of products will be considered only within thirty five (35) calendar days after date of Notice to Proceed. Subsequent requests will be considered only in case of product unavailability or other conditions beyond control of Contractor.

B. Substitutions will not be considered when indicated on shop drawings or product data submittals without separate formal request or when requested directly by subcontractor or supplier.

C. Substitute products shall not be ordered or installed without written acceptance.

D. Only one request for substitution for each product will be considered. When substitution is not accepted, provide specified product.

E. Engineer will determine acceptability of substitutions.

1.4 REQUESTS FOR SUBSTITUTIONS

A. Submit separate request for each substitution. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents.

B. All substitutions related to Access (ACS), Fire and Life Safety (FLS), and Structural Safety (SSS) are considered construction changes and shall be submitted to the Division of State Architect (DSA) for review and approval.

C. Identify product by specifications section and article numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and suppliers as appropriate.

D. Attach product data as specified in Section 01 33 00.

E. Give itemized comparison of proposed substitution with specified product, listing variations, and reference to specifications section and article numbers.

F. Give quality and performance comparison between proposed substitution and specified product.

G. Give cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.

H. List availability of maintenance services and replacement materials.

I. State effect of substitution on construction schedule and changes required in other work or products.

1.5 CONTRACTOR REPRESENTATION

A. Request for substitution constitutes representation that Contractor has investigated proposed product and has determined that it is equal to or superior in all respects to specified product.

B. Contractor will provide same warranty to substitution as for specified product.

C. Contractor will coordinate installation of accepted substitute, making such changes as may be required for work to complete in all respects.

D. Contractor certifies that cost data presented is complete and includes all related costs under this Contract.

E. Contractor waives claims for additional costs related to substitution which may later become apparent.

1.6 SUBMITTAL PROCEDURES

A. Submit request for substitution to Engineer on EADOC as specified under Section 01 33 00.

B. Engineer will review Contractor's requests for substitutions with reasonable promptness, no later than three working days, and will notify Contractor, in writing on EADOCs or decision to accept or reject requested substitution.

C. For accepted products, submit shop drawings, product data and samples under provisions of Section 01 33 00.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 11

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Requirements of this Section apply to Prime Contractor.

1. The term "Contractor" as used in this Section, applies to each Prime Contractor.

C. Related Sections:

1. Section 01 27 50 – Allowances: for administrative requirements for using allowances.
2. Section 01 60 00 Product Requirements and Substitutions: for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Engineer will issue through Construction Manager, supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on EADOC.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Engineer, through Construction Manager, will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. See Division 0, General Conditions, Article 9.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect, through Construction Manager. See Division 0, General Conditions, Article 9.

C. Contractor shall use the Proposal Request Form issued by the Owner.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Price Request, Construction Manager will issue a Change Order for signatures of Owner, Contractor, Architect, and Construction Manager on EADOC.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 27 50

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Bid Proposal

B. General Conditions, Article 9: Changes

C. Section 01 26 00 – Contract Modification Procedures

1.2 ALLOWANCES

A. Allowances are described in the bid proposal.

B. Use of the Allowance is determined by the District.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 27 50

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Requirements of this Section apply to the Prime Contractor.

1. The term “Contractor” as used in this Section, applies to Prime Contractor.

C. Related Sections:

1. Section 01 26 00 “Contract Modification Procedures” for administrative procedures for handling changes to the Contract.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor’s Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
   a. Application for Payment forms with Continuation Sheets.
   b. Submittals Schedule.
   c. Contractor’s Construction Schedule.
2. Submit the Schedule of Values to Architect through Construction Manager within five (5) calendar days of the execution of the contract.
3. Subschedules: If The Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section, including specification sections within Division 1.

1. Identification: Include the following Project Identification on the Schedule of Values:
    a. Project name and location.
    b. Name of Engineer.
    c. Engineer's project number.
    d. Contractor's name and address.
    e. Date of submittal.
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
    a. Each Phase shall be shown with its related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value.
        i) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual Table of Contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum. Submit schedule of values for District Approval.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Provide separate line item in the Schedule of Values for maintenance and updating of Project Record Documents as specified in Section 01 78 00 "Project Record Documents."

8. Allowances: Provide a separate line item in the Schedule of Values for each allowance.
9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
10. Schedule Updating: When Change Orders result in a change in the Contract Sum, include each Change Order as a new line item.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect, Construction Manager, and Project Inspector and paid by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Draft: Submit a "pencil copy" draft update for Construction Manager review and consent prior to submitting final copy in EADOC for payment.

D. Payment Application shall be submitted in conjunction with a correlated Monthly Schedule Update.

E. Record Documents shall be updated and will be verified by Construction Manger in conjunction with payment application approval. Updated Record Documents required:
   1. As-built drawings, Specifications, and Product Data in accordance with specification section 01 78 00 (Project Record Documents)
   2. Test and Inspection Log
   3. Manufacturer's field reports
   4. Contractor's Daily Reports (in EADOC)

F. Payment Application Forms: Use EADOC for payment applications. Submit one (1) wet-signed copy upon CM approval of each Application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
      a. Submit Conditional Waiver for construction period covered by Application for Payment being submitted.
      b. Submit Unconditional Waiver for construction period covered by previous Application.
   2. When an application shows completion of an item, submit final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Updated Contractor's Construction Schedule, as specified in Section 01 32 16 "Construction Progress Documentation," must be submitted concurrently to submittal of each Application for Payment.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.
16. Initial settlement survey and damage report if required.

J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: Refer to the General Conditions, paragraph 8.4 for Final Payment requirements. Submit final Application for Payment with releases and

supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of all Project closeout requirements.
    a. Refer to Section 01 77 10 “Closeout Procedures” for closeout requirements.
    b. Refer to Section 01 78 00 “Project Record Documents” for record document requirements.
2. Evidence of completion of all Project Punchlist items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. “Contractor’s Affidavit of Payment of Debts and Claims.”
6. “Contractor’s Affidavit of Release of Liens.”
7. “Consent of Surety to Final Payment.”
8. Evidence that claims have been settled.
9. Final, liquidated damages settlement statement.

L. Upon completion of the Work of this contract, Contractor shall file affidavit with Owner, sworn to before a Notary Public, stating that all workers and persons employed, all firms supplying materials, and all subcontractors have been paid in full and that there are no bills outstanding against the project for either labor or materials, except those items, if any, to be set forth in such affidavit, covering disputed claims or items in connection with Notices to Withhold (Mechanics Lien or Stop Notice) which have been filed under the provisions of the statutes of the State of California. At the same time, Contractor shall execute a Contractor’s Affidavit of Release of Liens, with separate release or waiver of lien from each subcontractor and material or equipment supplier.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 13

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. The District has adopted the EADOC system for the electronic transmittal of data and documents relating to the Work and the Contract Documents for the duration of the Work. This Section specifies administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Information (RFI's).

B. Related Sections:

1. Section 01 32 16 "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
2. Section 01 71 23 "Field Engineering and Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 01 77 10 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

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

1. Coordinate structural, mechanical, and electrical elements prior to installation. All penetrations of structural elements must first receive approval of Engineer. Rerouting of ductwork, piping, or conduit caused by failure to coordinate

beforehand is the responsibility of the affected subcontractor and will not be considered justification for additional cost.

2. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
3. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
4. Make adequate provisions to accommodate items scheduled for later installation.
5. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
6. The manner in which the Specifications are divided into Divisions and Sections is not intended to indicate division of work between trades nor indicate trade union or jurisdictional agreements.
    a. Assign and subcontract construction activities, and employ workers in a manner that will not risk jurisdictional disputes that could result in conflicts, delays, claims, or losses.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
    1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

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

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
    1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 SUPERVISION

A. Contractor is solely responsible for construction means, methods, techniques, sequences, and procedures for performing all Work.

1.6 SUBMITTALS

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

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable.

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, plumbing, and electrical systems.

b. Indicate required installation sequences.

c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Engineer for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

d. Indicate key plan, north arrow, and sufficient grid lines to provide cross reference to contract Drawings.

2. Sheet Size: At least 8-1/2 x11-inches, but no larger than 30 x 40-inches.

a. Provide title block on each sheet with locations for signatures from all subcontractors involved. Include statement that each subcontractor has reviewed coordination drawings in detail and coordinated work of their respective trade.

3. Number of Copies: Submit copies of each submittal on EADOC. Engineer through Construction Manager, will review and respond on EADOC.

4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

B. Key Personnel Names: At the pre-construction meeting, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list on EADOC. Keep list current at all times.

1.7 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

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

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

1.8 PROJECT MEETINGS

A. General: Construction Manager will schedule and conduct meetings and conferences at Project site, unless otherwise indicated. Construction Manager will:

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

B. Preconstruction Conference: Construction Manager will schedule a preconstruction conference before starting construction.

1. Attendees: Authorized representatives of Owner, Construction Manager, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; suppliers, representatives of state agencies having jurisdiction and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFI's.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. LEED requirements.
    l. Preparation of Record Documents.
    m. Use of the premises and existing building.
    n. Work restrictions.
    o. Owner's occupancy requirements.
    p. Responsibility for temporary facilities and controls.
    q. Construction waste management and recycling.
    r. Parking availability.

s. Office, work, and storage areas.

t. Equipment deliveries and priorities.

u. First aid.

v. Security.

w. Progress cleaning.

x. Working hours.

3. Minutes: Record and distribute meeting minutes.

C. Pre-installation Conferences: Contractor shall conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer and Construction Manager of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.

b. Options.

c. Related RFI's.

d. Related Change Orders.

e. Purchases.

f. Deliveries.

g. Submittals.

h. Review of mockups.

i. Possible conflicts.

j. Compatibility problems.

k. Time schedules.

l. Weather limitations.

m. Manufacturer's written recommendations.

n. Warranty requirements.

o. Compatibility of materials.

p. Acceptability of substrates.

q. Temporary facilities and controls.

r. Space and access limitations.

s. Regulations of authorities having jurisdiction.

t. Testing and inspecting requirements.

u. Installation procedures.

v. Coordination with other work.

w. Required performance results.

x. Protection of adjacent work.

y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner ,Construction Manager, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

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

i) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

i) Interface requirements.

ii) Sequence of operations.

iii) Status of submittals.

iv) Deliveries.

v) Off-site fabrication.

vi) Access.

vii) Site utilization.

viii) Temporary facilities and controls.

ix) Work hours.

x) Hazards and risks.

xi) Progress cleaning.

xii) Quality and work standards.

xiii) Status of correction of deficient work items.

xiv) Field observations.

xv) RFI's.

xvi) Status of proposal requests.

xvii) Pending changes.

xviii) Status of Change Orders.

xix) Pending claims and disputes.

xx) Documentation of information for payment requests.

3. Minutes: Record the meeting minutes.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

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

1.9 REQUESTS FOR INFORMATION (RFI's)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified on EADOC.

   1. RFI's shall originate with the Contractor. RFI's submitted by entities other than Contractor will be returned with no response.

   2. Coordinate and submit RFI's in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of RFI: Include a detailed, legible description of item needing interpretation or clarification, and the following:

   1. Project name.

   2. Date.

   3. Name of Contractor.

   4. Name of Engineer.

   5. RFI number, numbered sequentially.

   6. Specification Section number and title and related paragraphs, as appropriate.

   7. Drawing number and detail references, as appropriate.

   8. Field dimensions and conditions, as appropriate.

   9. Contractor's suggested solution(s). If Contractor(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

   10. Contractor's signature.

   11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other supplementary information necessary to fully describe items needing interpretation.

a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

b. Attachments shall be in Adobe Acrobat PDF format on EADOC.

C. Engineer's and Construction Manager's Action: Engineer and Construction Manager will review each RFI, determine action required, and return it. Allow five (5) working days for Engineer's response for each RFI. RFI's received after 1:00 P.M. will be considered as received the following working day.

1. No extension of Contract Time will be authorized due to Contractor's failure to allow sufficient time for Engineer's RFI review.
2. The following RFI's will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFI's or RFI's with numerous errors.
3. Engineer's action may include a request for additional information, in which case Engineer's time for response will start again.
4. Engineer's action on RFI's that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01250 "Contract Modification Procedures."
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, follow the procedures in the General Conditions, paragraph 9.6.

D. On receipt of Engineer's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer and Construction Manager within five working days if Contractor disagrees with response.

1. RFI Log: The RFI log is automatically updated in EADOC.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 13

SECTION 01 32 16

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.

B. Related Sections:

1. Section 01 29 00 "Payment Procedures" for submitting the Schedule of Values.
2. Section 01 31 13 "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
4. Section 01 43 00 "Quality Assurance" for submitting a schedule of tests and inspections.

1.3 REFERENCES

A. Associated General Contractors of America (AGC):

1. Construction Planning and Scheduling.

1.4 DEFINITIONS

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

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Engineer and Construction Manager.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

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

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

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

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

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

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

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

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

K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.5 SUBMITTALS

A. Qualification Data: For scheduling consultant.

1. If Owner waives requirement for scheduling consultant as specified in Part 3, submit qualification data for Contractor's in-house personnel responsible for preparing construction schedules.

B. Submittals Schedule: Submit three full-size copies of schedule and post on EADOC. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.

6. Scheduled date for Architect's and Construction Manager's final release or approval.

C. Preliminary Construction Schedule: Submit three full-size opaque copies and post on EADOC.

1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.

D. Preliminary Network Diagram: Submit three opaque copies, large enough to show entire schedule for entire construction period and post on EADOC.

E. Contractor's Construction Schedule: Submit three full-size opaque copies of initial schedule, large enough to show entire schedule for entire construction period and post on EADOC

F. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports and post on EADOC. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date, if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

G. Daily Construction Reports: Submit three copies at weekly intervals.

1.6 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 48 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 13 "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.

6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.7 COORDINATION

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

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
   2. Initial Submittal: Submit at the pre-construction conference. Include all submittals required. List those on the critical path required to maintain orderly progress of the Work.
   3. Final Submittal: Submit within five (5) calendar days of the "Notice to Proceed"..

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning and Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

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

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 30 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures," in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than 10 working days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's, Inspector of Record's, and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work Under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 11 00 "Summary of Work." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 11 00 "Summary of Work." Delivery dates indicated stipulate earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:
    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.
7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    a. Subcontract awards.

b. Submittals.

c. Purchases.

d. Mockups.

e. Fabrication.

f. Sample testing.

g. Deliveries.

h. Installation.

i. Tests and inspections.

j. Adjusting.

k. Curing.

l. Startup and placement into final use and operation.

8. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

   a. Structural completion.

   b. Permanent space enclosure.

   c. Completion of mechanical installation.

   d. Completion of electrical installation.

   e. Substantial Completion.

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

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

1. Refer to Section 01 29 00 ”Payment Procedures,” for cost reporting and payment procedures.

2. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Engineer’s approval, be assigned to fabrication and delivery activities. Costs shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable), in the amount of five percent of the Contract Sum.

3. Each activity cost shall reflect an accurate value subject to approval by Engineer.

4. Total cost assigned to activities shall equal the Contract Sum.

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

G. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule at the Pre-Construction Conference.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 working days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within five (5) working days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 working days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 15 working days after date established for the Notice to Proceed.
    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Engineer's approval of the schedule.
2. Conduct educational workshops to train and inform key personnel, including subcontractor's personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time. Include list of non-working days and holidays incorporated into the schedule.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.

c. Purchase of materials.

d. Delivery.

e. Fabrication.

f. Utility interruptions.

g. Installation.

h. Work by Owner that may affect or be affected by Contractor's activities.

i. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those from interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Sub-networks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinate with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In the first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In the second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
    a. In both value summary lists, tabulate “actual percent complete” and “cumulative value completed” with total at bottom.

2.5 REPORTS

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

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

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

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within two working days of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

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

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

C. Distribution: Post copies of approved schedule on EADOC. Provide Construction Manager with two full-size copies.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made post updated schedules on EADOC.

END OF SECTION 01 32 16

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals..

B. Related Sections:

1. Section 01 29 00 ”Payment Procedures” for submitting Applications for Payment and the Schedule of Values.
2. Section 01 31 13 ”Project Management and Coordination” for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Section 01 32 16 ”Construction Progress Documentation” for submitting schedules and reports, including Contractor’s Construction Schedule, Submittals Schedule, and Daily Construction Reports.
4. Section 01 43 00 ”Quality Assurance” for submitting test and inspection reports and for mockup requirements.
5. Section 01 77 10 ”Closeout Procedures” for submitting warranties.
6. Divisions 2 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect’s and Construction Manager’s responsive action.

B. Informational Submittals: Written information that does not require Architect’s and Construction Manager’s responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: PDF Electronic copies of the Contract Drawings provided by Architect will be posted on EADOC for Contractor’s use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Section 01 32 16 ”Construction Progress Documentation” for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect’s receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.
1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect, through Construction Manager, will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in the same manner as initial submittal.
3. Re-submittal Review: Allow 15 working days for review of each re-submittal.

E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide space approximately 6 x 8-inches on label or beside title block to record Contractor’s review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name and address of Architect and Construction Manager.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Submittal number, including revision identifier.
        i) Re-submittal numbers shall use the original submittal number followed by a decimal point and sequential number (e.g. 15.1

indicates first re-submittal of Submittal No. 15, 15.2 indicates second re-submittal)

i. Number and title of appropriate Specification Section.

j. Drawing number and detail references, as appropriate.

k. Location(s) where product is to be installed, as appropriate.

l. Other necessary identification.

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

G. Transmittal: Package each submittal individually and appropriately and post on EADOC. Architect**,** through Construction Manager, will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:
   a. Project name.
   b. Date.
   c. Destination (To:).
   d. Source (From:).
   e. Names of subcontractor, manufacturer, and supplier.
   f. Category and type of submittal.
   g. Submittal purpose and description.
   h. Specification Section number and title.
   i. Drawing number and detail references, as appropriate.
   j. Submittal number.
   k. Submittal and transmittal distribution record.
   l. Remarks.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
3. Include Special Environmental Requirements Product Submittal Form as required by specifications section 01 35 43.
4. Submittals without proper transmittal forms will be returned without review.

H. Re-submittals: Make re-submittals in same form and post on EADOC.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "No Exceptions Taken" or "Make Corrections Noted."

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating "No Exceptions Taken" or "Make Corrections Noted" taken by Architect.

1. Make corrections requested by Architect on submittals marked "Make Corrections Noted."

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. Copies of Architect's and Engineer's electronic CAD files will not be made available for use in connection with Project. Copies of Architect's electronic PDF files will be posted on EADOC.

B. At Contractor's written request, read-only drawing files will be made available to Contractor at local reproduction service to be specified by Architect. Contractor is responsible for all reproduction and printing costs, and pickup of requested drawings.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Standard color charts.
    e. Weights.
    f. Manufacturer's catalog cuts.
    g. Wiring diagrams showing factory-installed wiring.
    h. Electrical power requirements.
    i. Printed performance curves.
    j. Operational range diagrams.
    k. Mill reports.

l. Standard product operation and maintenance manuals.

m. Compliance with specified referenced standards.

n. Testing by recognized testing agency.

o. Application of testing agency labels and seals.

p. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.

5. Number of Copies: Submit copies of Product Data on EADOC.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed detail.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions.

b. Weights.

c. Identification of products.

d. Fabrication and installation drawings.

e. Roughing-in and setting diagrams.

f. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.

g. Electrical power requirements.

h. Shop work manufacturing instructions.

i. Templates and patterns.

j. Schedules.

k. Design calculations.

l. Compliance with specified standards.

m. Notation of coordination requirements.

n. Notation of dimensions established by field measurement.

o. Relationship to adjoining construction clearly indicated.

p. Seal and signature of professional Architect if specified.

q. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11- inches but no larger than 30 x 42-inches.

3. Number of Copies: Submit five opaque (bond) copies of each submittal. Architect, through Construction Manager, will return two copies. Mark up and retain one returned copy as a Project Record Document. Post on EADOC.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of appropriate Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    a. Number of Samples: Submit three full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will retain two sets and return one set.
5. Samples for Verification: Submit full-size units of Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Unless indicated otherwise, submit four sets of Samples. Architect and Construction Manager will retain two Sample sets; remaining two sets will be returned.
        i) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        ii) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by Sample, submit at least two sets of paired units that show approximate limits of variations.

E. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 16 "Construction Progress Documentation."

F. Submittals Schedule: Comply with requirements specified in Section 01 32 16 ”Construction Progress Documentation.”

G. Application for Payment: Comply with requirements specified in Section 01 29 00 ”Payment Procedures.”

H. Schedule of Values: Comply with requirements specified in Section 01 29 00 ”Payment Procedures.”

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
    a. Post copies of subcontractor list on EADOC.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Post copies of each submittal on EADOC.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements specified in Section 01 43 00 ”Quality Assurance.”

B. Coordination Drawings: Comply with requirements specified in Section 01 31 13 ”Project Management and Coordination.”

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

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Report (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

I. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

J. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturer's names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

K. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 43 00 "Quality Assurance."

L. Preconstruction Test Reports: Prepare test reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

M. Compatibility Test Reports: Prepare test reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

N. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product of after product is installed in its final location, for compliance with requirements in the Contract Documents.

O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of coverage.

2.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with Contract Documents.

3.2 ARCHITECT'S ACTIONS

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect's review is for general conformance with design concept, only, and does not relieve Contractor in any way from compliance with Contract Documents, nor does it in any way constitute a Change Order. Contractor remains solely responsible for details and accuracy, all quantities and dimensions, and selection of fabrication processes.

C. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. No Exceptions Taken: Work covered by submittal may proceed provided it complies with the requirements of the Contract Documents. Compliance with Contract Documents will be a condition of acceptance of Work.
2. Make Corrections Noted: Work covered by submittal may proceed provided it complies with Architect's notations or corrections. Compliance with Contract Documents will be a condition of acceptance of Work.
3. Revise and Resubmit: Do not proceed with Work covered by submittal, including purchasing, fabrication, delivery, or other activity. Revise submittal in accordance with Architect's notations and resubmit without delay. Repeat if necessary.
4. Rejected, See Remarks: Do not proceed with Work covered by submittal, including purchasing, fabrication, delivery, or other activity. Revise submittal or

prepare new submittal in accordance with Architect's notations and resubmit without delay.

5. Remarks Attached: Follow Architect's remarks and instructions attached to submittal. Remarks may be in conjunction with one of the four actions listed above.

D. Informational Submittals: Architect and Construction Manager will review each submittal and will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.

E. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

SECTION 01 43 00

QUALITY ASSURANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include:

1. Section 01 32 16 "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Section 01 73 29 "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
3. Divisions 2 through 49 Sections for specific test and inspection requirements.

1.3 REFERENCES

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

1. ASTM E 548: Guide for General Criteria Used for Evaluating Laboratory Competence.

B. Code of Federal Regulations (CFR):

1. 29 CFR 1910, Subpart A, Section 1910.7: Definitions and Requirements for a Nationally Recognized Testing Laboratory.

C. NIST: National Institute of Standards and Technology.

1.4 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

K. Experienced: When used with an entity, “experienced” means having successfully completed a minimum of five previous projects similar in size and scope to this

Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.5 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Description of test and inspection.
   3. Identification of applicable standards.
   4. Identification of test and inspection methods.
   5. Number of tests and inspections required.
   6. Time schedule or time span for tests and inspections.
   7. Entity responsible for performing tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Division of the State Architect project application number.
   4. Name, address, and telephone number of testing agency.
   5. Dates and locations of samples and tests or inspections.
   6. Names of individuals making tests and inspections.
   7. Description of the Work and test and inspection method.
   8. Identification of product and Specification Section.
   9. Complete test or inspection data.

10. Test and inspection results and an interpretation of test results.
11. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
12. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
13. Name and signature of laboratory inspector.
14. Recommendations on retesting and re-inspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to product required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and acceptable to authorities having jurisdiction.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. Factory-Authorized Service Representative Qualifications: An authorized representative who is trained and approved by manufacturer to inspect installation of

manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups, to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work.

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect and Construction Manager five working days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
5. Allow five (5) working days for initial review and each re-review of each.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed, unless otherwise indicated.

J. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 2 through 49.

1.8 QUALITY CONTROL

A. Owner will provide inspections, tests, and similar quality control services specified to be performed by independent agencies, except where indicated as Contractor's responsibility. Costs for Owner-provided inspections and tests are not included in Contract Sum.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and description of types of testing and inspecting they are engaged to perform.
2. Notify Project Inspector and testing agencies, at least two working days in advance of time when Work that requires testing or inspecting will be performed.
3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Where tests and inspections are indicated as Contractor's responsibility, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
2. Notify Project Inspector and testing agencies, at least two working days or as indicated otherwise in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Service: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."

D. Retesting/Re-inspecting:

1. Where quality-control services are Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaces or is necessitated by Work that failed to comply with the Contract Documents.
2. Where quality-control services are Owner's responsibility, costs for retesting and re-inspecting construction that replaces or is necessitated by Work that

failed to comply with the Contract Documents will be charged to Contractor, by way of a deductive Change Order.

E. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities. Provide timely notice of the Work's readiness for all required tests and inspections.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 20 working days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.9 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency/Special Inspector as required by authorities having jurisdiction, as indicated in DSA Structural Tests and Inspections sheet (DSA Form 103-1) at end of this Section, in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

1.10 PROJECT INSPECTOR

A. Owner will engage a qualified Inspector acceptable to Architect, and authorities having jurisdiction. Primary duty of the Inspector is to inspect the Work for compliance with the Contract Documents.

1. The duties of the Inspector are defined in Title 24, Part 1, Chapter 4
2. The Inspector will report to the Owner and Construction Manager.

B. Provide free access to all parts of the Work at all times, so as to allow continuous observation by the Inspector. Presence of the Inspector does not relieve the Contractor in any way from requirement to comply with the Contract Documents.

C. Notify Inspector at least two working days in advance of time when work that requires inspecting will be performed.

D. Provide reasonable facilities for Inspector's use in performing inspection duties, as specified in Section 01 50 00 "Temporary Facilities and Controls."

E. Inspector shall have authority to stop the Work in the event Contract Documents are not being complied with, but is not authorized to change requirements contained in the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or Special Inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur on EADOC. Provide access to test and inspection log for Architect's and Construction Manager's reference.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Comply with Contract Document requirements for Section 01 73 29 "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 43 00

SECTION 01 45 24

INSPECTING SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Inspecting services, other than those performed by testing laboratories, to measure and report quality and performance of construction.

1.2 REFERENCES

A. CCR – California Code of Regulations.

1.3 INSPECTION BY OWNER'S PROJECT INSPECTOR

A. Owner will employ building inspector to serve as Project Inspector to Owner in accordance with regulations of Division of the State Architect and subject to provisions of Part 1, Title 24, CCR.

B. Project Inspector's authority, rights, and duties shall be as set forth in Section 4-342, Part 1, Title 24, CCR.

1. Project Inspector shall make semi-monthly reports in writing to Engineer with copies forwarded to Owner and Division of the State Architect in accordance with Section 4-337, Part 1, Title 24, CCR.
2. Project Inspector shall notify Division of the State Architect:
    a. When work is started on the project.
    b. When work is suspended for a period of more than 2 weeks.
3. Project Inspector shall keep record of certain phases of construction which shall be maintained on project site until completion. Upon completion, these records shall be copies with original delivered to Owner for permanent school records and copy forwarded to Engineer.
4. Project Inspector shall monitor work of Special Inspectors and testing laboratories to ensure testing program is satisfactorily completed.
5. Project Inspector shall notify Contractor in writing of deviations from Contract Documents. Copies of such notice shall be forwarded immediately to Engineer and Division of the State Architect.
6. Project Inspector shall make and submit Verified Reports in accordance with Section 4-336, Part 1, Title 24, CCR. Verified reports shall be submitted directly to Division of the State Architect with copy forwarded to Engineer.
7. Project Inspector shall prepare detailed statements of fact regarding materials, operations, and other related issues when requested by Division of the State Architect. Such statements shall be submitted directly to Division of the State Architect with copy forwarded to Engineer.

C. Cooperate with Project Inspector. Provide access to work at all times whether it is in preparation or progress. Provide proper facilities for access and inspection.

D. Perform no work except with the knowledge of Project Inspector. Cover no work prior to inspection.

E. Notify Project Inspector in writing at least 24 hours prior to expected time for operations requiring inspection.

F. If work is performed on Saturdays, Sundays, holidays or beyond normal working hours, the Inspectors will be paid at overtime rates by Owner. Cost of Project Inspector's premium time will be deducted by Owner from Contract Sum by Change Order.

G. Contractor shall pay cost of Project Inspector's salary for time Project Inspector is required on project beyond allotted contract time. Cost of Project Inspector's salary shall be in addition to liquidated damages outline in Supplementary Conditions and will be deducted by Owner from Contract Sum by Change Order.

1.4 INSPECTION BY DIVISION OF THE STATE ARCHITECT

A. Work will be inspected by Division of the State Architect according to Section 4-334, Part 1, Title 24, CCR.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 45 24

SECTION 01 45 29

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements and procedures for Owner-provided testing laboratory services.

B. Requirements and procedures for Contractor-provided testing and inspection services.

1.2 RELATED SECTIONS

A. General Conditions: Inspections, testing and approvals required by public authorities.

B. Section 01 33 00 - Submittal Procedures: Manufacturer's test reports.

C. Section 01 45 24 - Inspecting Services: Project Inspector; inspection by Division of the State Architect.

D. Section 01 77 10 - Closeout Procedures and Submittals: Record documents.

E. Individual Specification Sections: Inspections and tests required, and standards fortesting.

1.3 REFERENCES

A. CBC - California Building Code, latest edition.

B. CCR - California Code of Regulations.

1.4 REGULATORY REQUIREMENTS

A. Testing, sampling and preparing samples will be in accordance with standards referenced in individual specification sections and in applicable sections of CBC.

B. Testing and submitting test reports will conform to provisions of Section 4-335, Part 1, Title 24, CCR.

1.5 SELECTION AND PAYMENT

A. Owner will employ and pay for services of testing agencies acceptable to Division of the State Architect to conduct required tests and inspections for project.

1. Soils: Owner will employ and pay for services of Geotechnical Engineer to observe excavating, grading, and filling operations and to provide testing of soil materials as required by Division of the State Architect and as specified in individual sections of this specification. Geotechnical Engineer will have management, laboratory and field supervisory personnel with minimum 5 years experience in testing and inspection of soils materials and will have adequate facilities, equipment, and technical references to permit performance of testing and inspections within applicable regulations and standards in accordance with Section 4-335, Part 1, Title 24, CCR.

2. Other Construction: Owner will employ and pay for services of Testing Laboratory to conduct tests, inspections, and special inspections as required by Division of the State Architect and as specified in individual sections of this specification.
   a. Construction Requiring Testing and Inspection Other Than Special Inspection: Testing Laboratory will have management, laboratory and field supervisory personnel with minimum 5 years experience in testing and inspection of work and materials of construction and will have adequate facilities, equipment, and technical references to permit performance of testing and inspections within applicable regulations and standards in accordance with Section 4-335, Part 1, Title 24, CCR.
   b. Construction Requiring Special Inspection: Testing Laboratory will have Special Inspectors specially approved by Division of the State Architect to conduct special inspections as required by Division of the State Architect under provisions of Section 4-333, Part 1, Title 24, CCR.

B. Retesting: When initial tests indicate non-compliance with Contract Documents, subsequent retesting occasioned by non-compliance shall be performed by same testing agency and costs thereof will be deducted by Owner from Contract Sum by Change Order.

C. Retesting Covered Work: Reexamination of previously tested and inspected work may be ordered by Architect and by Project Inspector. Contractor shall uncover such work if retesting is ordered. If work is found in accordance with Contract Documents, Owner will pay costs of uncovering, removing, retesting and replacing. If work is found not in accordance with Contract Documents, Owner will deduct cost of retesting from Contract Sum by Change Order and Contractor will bear costs of uncovering, removing and replacing work.

D. Testing and inspecting performed for Contractor's convenience, such as testing and inspection to establish equivalence of substitutions, equivalence of repairs to damaged materials, and testing and inspecting to expedite operations, shall be Contractor's responsibility.

   1. Contractor shall employ licensed professional engineer of discipline required to develop testing program which will establish equivalency.

2. Contractor shall submit testing program to Engineer for review.
3. Contractor shall arrange testing in accordance with accepted testing program to be performed by Owner's Testing Laboratory.
4. Costs of testing done by Owner's Testing Laboratory for Contractor will be deducted from Contract Sum by Change Order.
5. Contractor may not arrange for testing upon portions of work already completed except with written consent of Engineer.

E. Employment of Testing Laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

F. Engineer and Project Inspector shall have right to make tests at any time on materials or work done whether those materials are specified or substituted items.

1.6 AGENCY RESPONSIBILITIES

A. Provide qualified personnel at site. Cooperate with Architect, Project Inspector and Contractor in performance of services.

B. Perform specified sampling and testing of materials in accordance with specified standards.

C. Ascertain compliance of materials and mixes with requirements of Contract Documents.

D. Promptly notify Division of the State Architect, Engineer, Project Inspector and Contractor of observed irregularities and non-conformance of work and products.

E. Perform additional tests required by Architect and Division of the State Architect.

F. Attend pre-construction meeting. Attend progress meetings as requested.

1.7 AGENCY REPORTS

A. Test/Inspection Reports:

1. Reports will comply with Section 4-335(d), Part 1, Title 24, CCR.
2. Include every test and inspection made regardless of whether such tests and inspections indicate that material and procedures are satisfactory or unsatisfactory.
3. Include records of special sampling operations as required.
4. Indicate that materials were sampled and tested in accordance with requirements of CCR regulations and Construction Documents.
5. Indicate specified design strength of materials such as masonry, concrete, and steel.

6. State whether or not materials and procedures comply with requirements of Construction Documents.
7. Submit copies of reports to Division of the State Architect, Owner, Architect, Project Inspector, Structural Engineer, Civil Engineer, Geotechnical Engineer, and Contractor within 14 days of tests. Submit copies of reports of non-complying materials and procedures immediately.

B. Verified Reports:

1. Geotechnical Engineers inspecting placement of fills and Special Inspectors will submit Verified Reports in accordance with Section 4-336, Part I, Title 24, CCR. Submit two copies of reports directly to Division of the State Architect; forward
one copy each to Owner, Architect and Project Inspector.
2. Geotechnical Engineers and Testing Laboratories conducting tests on material will submit verification of test reports at competition of testing program and when required by Division of the State Architect in accordance with Section 4-335(e), Part I, Title 24, CCR.
   a. The Final Laboratory Verified Report or Laboratory Affidavit will indicate whether every material tested passed and disposition of problems associated with earlier deficient test reports.
   b. Submit two copies of each report directly to Division of the State Architect; forward one copy each to Owner, Architect and Project Inspector.

1.8 LIMITS ON AGENCY AUTHORITY

A. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of
Contract Documents.

B. Agency or laboratory may not approve or accept any portion of work.

C. Agency or laboratory may not assume any duties of Contractor.

D. Agency or laboratory has no authority to stop work.

1.9 CONTRACTOR RESPONSIBILITIES

A. Package and deliver to laboratory at designated location adequate samples of materials proposed to be used which require testing. Samples shall be selected by laboratory personnel. Allow proper time for selecting samples, and making tests or considerations.

B. Cooperate with laboratory personnel, and provide access to work and to manufacturer's facilities.

C. Provide incidental labor and facilities to provide access to work to be tested, to obtain

and handle samples as selected by laboratory personnel at site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

D. Notify Project Inspector, minimum 24 hours prior to expected time for operations requiring inspection and testing services. Do not allow work to be covered prior to inspection and testing.

1.10 SCHEDULE OF INSPECTIONS AND TESTS

A. Testing Certificates Provided by Contractor:
   1. Certifications of materials.

B. Initial Testing Provided by Owner:
   1. Site Clearing: Test compaction of excavation backfill.
   2. Earthwork:
      a. Sample and test fill and base materials for compliance with specified requirements.
      b. Inspect placement of engineered fill.
      c. Inspect bottoms of footings and foundation trenches.
      d. Test compaction of each layer of engineered fill.
   3. Trenching:
      a. Inspect placement of trench backfill.
      b. Test compaction of trench backfill.
   4. Asphaltic Concrete Paving:
      a. Sample and test quality of paving and base if directed by Owner and Engineer.
      b. Test compaction of paving and base if directed by Owner and Engineer.
   5. Portland Cement Concrete Paving:
      a. Review mix designs.
      b. Sample and test compressive strength of concrete.
      c. Sample and test slump of concrete.

C. Initial Testing Performed by Owner's Testing Laboratory at Contractor's Cost: Cost of following initial tests, if required, will be deducted by Owner from Contract Sum by Change Order.

   1. Testing to establish equivalence of material not properly identified.
   2. Testing to establish equivalence of substitutions.
   3. Testing required to expedite Contractor's operations.
   4. Testing relating to repair of work which fails to meet specifications.
   5. Testing and inspection required to correct damage to material in shipping and erection.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION 01 45 29

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include:

1. Section 01 11 00 ”Summary of Work” for limitations on utility interruptions and other work restrictions.
2. Section 01 33 00 ”Submittal Procedures” for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Section 01 71 23 ”Field Engineering and Execution” for progress cleaning requirements.
4. Divisions 2 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 REFERENCES

A. National Fire Protection Association (NFPA):

1. NFPA 10: Standard for Portable Fire Extinguishers.
2. NFPA 241: Safeguarding Construction, Alteration, and Demolition Operations.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Engineer, testing agencies, and authorities having jurisdiction.

B. Water Service: Water from Owner’s existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service: Electric power from Owner’s existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, enclosures, utility hookups, staging areas, and parking areas for construction personnel.

B. Shop Drawing: Project Identification Sign. 4' high, 8' wide dimensions. Graphics, and layout to be provided by Owner

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fencing; minimum 6 feet high with galvanized steel pipe posts, with 1-5/8 inch OK top and bottom rails. Provide concrete or galvanized steel bases for supporting posts. Provide gates and locks.

B. Lumber and Plywood:

1. Lumber: Douglas fir-larch, No. 2.
2. Plywood: ½-inch C-D with exterior glue

C. Paint: Suitable for intended use, as recommended in writing by paint manufacturer.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 5 individuals. Provide electrical power service and 120V AC duplex receptacles, with not less

than one receptacle on each wall. Furnish room with conference table and chairs.

3. Drinking water.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
6. Hardwired telephone.
7. Data connections for internet use.
8. Digital Camera.

C. Project Inspector's Field Office: Provide heated and air-conditioned space of sufficient size to accommodate needs of Project Inspector. Project Inspector's field office space may be combined with Contractor's common-use field office. Furnish and equip as follows:

1. Desk and chair.
2. Layout table.
3. File cabinet.
4. Plan rack with capacity to hold 4 sets of plans.
5. Bookshelf.
6. Wastebasket.
7. Hardwired telephone.
8. Data connections for internet use.

D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures according to NFPA 10.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. First Aid Supplies: In compliance with governing regulations.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities as shown on the plans. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
2. If temporary service is not available, provide mobile or portable solutions, adequate to meet expected demand.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to private system indicated as directed by authorities having jurisdiction.

C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

1. Where installation below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use by construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Provide fully stocked supply of toilet tissue, paper towels, and other disposable materials as needed for sanitary facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead unless otherwise indicated.
2. Connect temporary service to Owner's existing power source, as directed by Owner.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security, safety and protection requirements without operating entire system.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install two telephone lines for each field office.

1. In addition to telephone lines specified above, provide telephone lines for the following:
    a. Provide a dedicated telephone line for each facsimile machine and each computer.
2. At each telephone, post a list of important telephone numbers.
    a. Police and fire departments.
    b. Ambulance service.
    c. Contractor's home office.
    d. Architect's office.
    e. Architect's office.
    f. Owner's office.
    g. Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. Provide traffic flaggers as required for safety and as noted on the drawings. Whenever road closures or restricted lanes are necessitated by the Work, provide adequate numbers of flaggers.

D. Parking: Owner will provide parking permits for construction personnel for designated areas in existing lots.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

F. Project Identification and Temporary Signs: Provide Project identification, traffic signs, detour signs, pedestrian path detour signs, and other signs. Engage an experienced sign company to produce project signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

a. Project identification sign shall be 8'-0" wide by 4'-0" high sign graphics and layout to be provided by the Owner with a minimum of three colors.

2. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touchup signs so they are legible at all times.
4. Conform to all applicable regulations of local authorities.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with requirements of Section 01 71 23 ”Field Engineering” for progress cleaning requirements.

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

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

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 01 11 00 ”Summary of Work.”

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

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

C. Stormwater Control: Comply with authorities having jurisdiction: Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Comply with requirements specified in Section 03 10 00 "Site Preparation and Plant Protection."

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring or rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

F. Site Enclosure Fence: Furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
3. Post "No Trespassing" signs on fences.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Provide secure lockup for stored materials and equipment which are of value or attractive for theft.

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

I. Prohibit smoking. Smoking is prohibited on the entire campus.

J. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, and other access routes for fighting fires.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project Identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 10 ”Closeout Procedures.”

END OF SECTION 01 50 00

SECTION 01 51 10

UTILITY SHUTDOWN

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Procedures and requirements for utility shutdown.

1.2 RELATED SECTIONS

A. Section 01 50 00: Temporary Facilities and Controls

PART 2 - PRODUCTS

N/A

PART 3 - EXECUTION

3.1 NOTICE TO DISTRICT

A. Contract shall provide a utility shutdown plan and provide a minimum of 72 hours notice to the District prior to any required shutdown of utilities using the Utility Shutdown Request Form at the end of this section. Large, widespread or complex utility shutdowns that affect College academic or administrative facilities may require longer than 72 hour notice.

3.2 RESUMPTION OF UTILITIES

A. Prior to resuming normal utility operation, ensure that all work is properly safed and/or capped.

[CONTINUED ON NEXT PAGE]

REQUEST FOR UTILITY SHUTDOWN FORM: **72-HOUR NOTICE**

Project No. / Contract No.:	**Sub-Contractor:**
Project Name:	**Building / Room No.:**
Prime Contractor:	**Depts. Affected:**

Shutdown requested by :

(Print Name)_____**Contractor Signature:**_____ _____
Date

To: WVMCCD / Facilities Management	**Date of Request :**
Shutdown of Service **Date:** **Time: Duration:**	**Restoration of Service** **Date:** **Time:**

SHUTDOWN TYPE **Safety Note! : Observe all "Lock-Out, Tag-Out" procedures when applicable!**

☐ MECHANICAL
☐ PLUMBING
☐ ELECTRICAL
☐ DATA / TELECOMMUNICATIONS
☐ FIRE PROTECTION SYSTEMS

☐ **APPROVED** **Signature: Construction Manager** _____
Date

☐ **REJECTED**

Campus_____
Date

District Facilities
Dept._____
Date

District IS Dept._____
Date

COMMENTS: (Attach additional sheet if required.)

END OF SECTION 01 51 10

SECTION 01 56 10

DUST CONTROL MEASURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The goal of these requirements is to prevent air pollution from airborne dust on construction projects by keeping construction dust from becoming airborne through wind or mechanical means. These requirements are also meant to prevent the spread of dust onto roadways and non-construction areas.

1.2 RELATED SECTIONS

A. Section 01 50 00: Temporary Facility and Controls

B. Section 01 57 30: Storm Water Pollution Prevention

C. Section 01 74 17: Site Maintenance and Cleanup

D. Section 01 74 19: Construction Waste Management and Disposal

E. Requirements of the Contract Documents

1.3 GENERAL REQUIREMENTS

A. The following general requirements shall be met on all projects within the District.

1. General Contractor shall develop and implement a Dust Control Plan that includes the following measures:

a. If necessary, water all active construction areas at least twice daily (with recycled water, if possible).

b. Cover all trucks hauling soil, sand, and other loose materials.

c. Apply water two times daily to all unpaved access roads, parking areas, and staging areas at construction sites

d. Sweep streets daily if visible soil material is carried onto adjacent streets.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 56 10

SECTION 01 56 39

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Fence all trees to remain in the Limit of Work, and trees shown on the drawing s to be protected, eight (8') beyond dripline and provide mulch to dripline.

2. Protection of trees and other plants that are scheduled to remain. Contractor shall avoid injury or damage resulting from the Contractor's operations, including:

   a. cutting, breaking, or skinning of roots, trunks, or branches.

   b. smothering or soil compaction by stockpiled materials, excavated materials, foot or vehicular traffic within the dripline.

   c. desiccation due to interruption of existing irrigation schedule.

3. Irrigation as directed or as required to maintain the health of trees and other plants to remain, where existing irrigation of such plants is shut down for the work of this Contract.

4. Restoration of existing landscape. Repair and/or replacement of trees and other plants damaged during the construction operation shall be at the Contractor's expense and to the Owner's satisfaction. Repair and/or replacement of any irrigation systems damaged or removed during the construction operation shall similarly be at the Contractor's expense and to the Owner's satisfaction.

B. Related Work: Consult all other applicable Sections. Coordinate installation with the work of other trades and with tree removal, pruning, and tying work by Owner.

1.2 QUALITY ASSURANCE

A. Before beginning work, Contractor shall meet with the Owner's Representative, Landscape Architect, and Project Arborist for a Pre-Construction meeting at the site to review all work procedures, access routes, storage areas, and tree protection measures.

B. Contractor shall notify Owner's Representative when installation of protective fencing and mulch is complete and shall not proceed with site work until such installation is approved by Owner's Representative.

C. Contractor shall keep Owner's Representative informed of the work schedule, so that

Owner's Representative may be on hand to observe the work and give direction regarding tree protection during the course of the work.

D. Monthly Inspections. The Project Arborist or Owner's Representative shall perform monthly inspections to monitor changing conditions and tree health. The Contractor shall take immediate corrective actions that are in non compliance with the care of the trees, plants, shrubs, and vegetation.

E. Landscape Architect Inspection. For discretionary development projects, prior to temporary or final occupancy the contractor shall call for the Landscape Architect to perform an on-site inspection of all plant stock, quantity of materials, planting, and that the irrigation is functioning consistent with the approved construction plans. Inspector of Record shall be in receipt of written verification of Landscape Architect approval prior to scheduling the final inspection.

1.3 SCHEDULING

A. Coordinate work schedule with tree work by Owner so that tree removal, pruning, and tying back of branches are complete before site work begins, and so that tree branches are tied back for the minimum amount of time necessary for the protection of the tree.

B. Install protective fencing and mulch before starting site work.

1.4 GUARANTEE

A. If a tree to remain is destroyed, or damaged so that in the judgment of the Owner's Representative it should be replaced, it shall be removed at Contractor's expense. Except as provided below, back charges will be assessed at the rate of $450.00 per inch of circumference at 12 inches above grade for trees with a diameter of 8 inches or less and at D.B.H. (Diameter at Breast Height) for diameters greater than 8 inches. For a tree designated as of special significance, the amount of back charges may be increased to a maximum of $50,000 at the discretion of the Owner.

B. If a shrub to remain is destroyed, or damaged so that in the judgment of the Owner's Representative it should be replaced, it shall be removed at the Contractor's expense. Back charges will be assessed at the rate of $300.00 per shrub.

C. If irrigated groundcover to remain is destroyed, or damaged so that in the judgment of the Owner's Representative it should be replaced, it shall be removed at the Contractor's expense. Unless shown or specified otherwise, back charges will be assessed at the rate of $20.00 per square foot of groundcover area.

D. If irrigated turf to remain is destroyed, or damaged so that in the judgment of the Owner's Representative it should be replaced, it shall be removed at the Contractor's expense. Unless shown or specified otherwise, back charges will be assessed at the rate of $20.00 per square foot of turf area.

PART 2 - PRODUCTS

2.1 TREE PROTECTION MATERIALS

A. Barricade Fence:

1. Fabric: Chainlink-type fencing, 6 feet high.

2. Posts: Metal posts, sufficient to hold fabric plumb and taut. Posts to be approved by Owner's Representative.

B. Anti-desiccant: Manufactured for use on plants. Provide evidence that material can be used on specified trees. Do not use anti-desiccant without approval of Owner's Representative.

C. Untreated burlap.

D. Black plastic sheets.

E. Wood chips.

PART 3 - EXECUTION

3.1 GENERAL

A. Protect existing trees from damage or injury.

B. Permit no storage, disposal, fires or stockpiling within dripline. Permit no traffic within and 8' beyond the dripline without prior approval by Owner's Representative.

C. No materials, equipment, spoil, or waste or washout water may be deposited, stored, or parked within and 8' beyond the dripline.

D. Prevent puddling or continuous running water within and 8' beyond the dripline.

E. If directed to do so, install silt fences, water diversion structures, or other erosion control devices to prevent siltation or erosion within and 8' beyond the dripline of trees to remain.

F. Maintain fire-safe areas around trees to remain. Permit no heat sources, flames, ignition sources, or smoking near mulch or trees.

G. Herbicides placed under paving materials shall be safe for use around trees and labeled for that use. Pesticides used on site shall be safe for use around trees and not easily transported by water.

H. Work within and 8' beyond the dripline of trees to remain shall be as directed by Owner's Representative. Earth surface within and 8' beyond the dripline shall not be changed except as shown or specified or as directed by Owner's Representative. Trenching, grading or excavation to below depth of root zone, within and 8' beyond the dripline, shall be done by hand. Excavation within and 5' beyond the dripline below root zone may be

done by means other than by hand if approved by Owner's Representative. Pruning shall be done between October and January. Only an ISA certified arborist using ISA pruning instructions shall do pruning. Roots larger than 1-inch that are in the way of the new utility may be cut with the approval of the Owner's Representative in consultation with the Owner's Grounds Department. Roots larger than 1-inch that are not in the way of the utility shall be protected as noted in Item I below.

I. Do not allow exposed roots to dry out before permanent backfill is placed. Protect exposed roots with 4 layers of wet untreated burlap anchored in place. Keep burlap moist until placement of backfill. Remove burlap at time of backfilling.

J. Exercise extreme care in removing concrete or asphalt within dripline. Paving pieces shall be lifted rather than dragged. Protect surface roots immediately with 4-inch layer of chipped mulch.

K. Where vehicles or equipment must operate or travel in unpaved landscape areas, Contractor shall place a minimum 10-inch layer of wood chips over the work area before starting work there. This mulch layer shall be replenished as necessary to maintain a ten-inch depth until operations in the area are complete. Contractor shall remove mulch upon completion of the work, and aerate the area, unless directed otherwise. Where crane outriggers or other heavy equipment must be positioned in unpaved landscape areas, contractor shall provide additional protection against soil compaction and landscape damage. Means of providing such additional protection may include the placement of base rock and heavy timbers beneath heavy equipment. Contractor shall obtain approval of Owner's Representative for protective measures before placing or operating heavy equipment in unpaved landscape areas.

L. Apply 3" deep layer of mulch beneath tree canopies and inside fences, but not within 3" of tree trunks. Wheeled equipment beneath driplines is not allowed.

M. Pruning of trees and tying back of branches shall be by Owner. Contractor shall identify access and clearance requirements for operation of equipment and shall inform Owner's Representative, Landscape Architect, and Project Arborist of these requirements at the pre-construction meeting and/ or pre-work site visit specified herein. Contractor shall coordinate work schedule with tree work by Owner and shall not begin work until tree work by Owner is complete. If additional requirements for pruning, tying of branches or vegetation removal arise during the course of the work, Contractor shall inform Owner's Representative immediately.

N. Any damage to trees due to Contractor's operations shall be reported to Owner's Representative immediately so that remedial action can be taken. Timeliness is critical to tree health.

O. Tree Removal. Tree removal work should be completed prior to the installation of construction. All trees to be removed should be identified by flagging or paint. Care should be taken not to damage trees to be preserved during pruning of felling. Removal of trees adjacent to protected trees shall be performed by a license tree care contractor and shall be supervised by an International Society of Arboriculture (ISA) certified arborist. All operations shall be in accordance with the ISA Tree Pruning Guidelines and adhere to the most recent editions of the American national Standard for Tree Care

Operations (ANSI Z133.1) and Pruning (A300). Pre-construction surveys for nesting birds and bats are necessary prior to removal of trees.

P. Stump Removal. Determine if stump has root entanglement with any trees that are to be preserved. If this is the case, these stump roots shall be severed prior to stump removal. Removal shall include grinding of stump and roots at a minimum dept of 24 inches, and exposure of soil beneath stump to provide drainage. In a sidewalk or small planter area to be replanted with new tree, the stump shall be completely removed and planting pit dug to a depth of 30 inches. Large surface roots of the stump shall be removed and the area tamped to settle the soil.

Q. No grading, construction, trenching, demolitioin, or other work shall be allowed in the tree protection zone. No excess soil, chemicals, debris, equipment, or other materials shall be dumped or stored within the tree protection zone.

R. Grading. Any grade changes outside the tree protected zone shall not significantly alter drainage to the tree. Grade changes within the tree protected zone are not allowed except under specifically approved circumstances by the Project Arborist or Landscape Architect and shall not allow more than 6 inches of fill soil or 4 inches of soil removed unless mitigated. Any impervious overly or grade changes over 6 inches within the tree protected zone shall incorporate an approved permanent aeration system, permeable material or other approved mitigation.

S. Additional Tree Protection Procedures. If injury should occur to any tree during construction, including broken branches, it should be reported to the Owner's Representative and the Project Arborist immediately and evaluate as soon as possible so that appropriate treatments can be applied. Any accumulated construction dust on the limbs or foliage of the trees is to be removed periodically via spray washing or as directed by the project arborist. If a soil compaction event such as the movement or use of heavy equipment, storage of materials, or paving occurs within the tree protection zone, soil conditions shall be improved using vertical mulching, radial trenching or other methods approved by the Project Arborist.

3.2 BARRICADES

A. Prior to any construction activities or equipment being brought on site, the contractor shall install protective fencing around all trees to remain, as directed by Owner's Representative.

B. Locate fence at 8' beyond dripline unless directed otherwise by Owner's Representative.

C. Locate roots before setting posts. Prevent damage to roots.

D. Space posts approximately 8- feet apart and securely attach fabric.

E. Protective fencing shall be plumb, taut, and sturdy.

F. Repair sagging or damaged protective fencing immediately. Remove protective fencing upon completion of work.

G. Protective fencing is to remain in place until all grading and construction is complete.

H. Maintain protective fencing at all times at original location in vertical, undamaged condition until construction project is complete.

3.3 IRRIGATION

A. Irrigate trees adjacent to construction activities during hot periods (June-October) until seasonal rainfall totals at least 8 inches of rain or until project completion. Apply ten (10) gallons of water per 1" of trunk diameter (measured at 4'-6") once per two (2) week period by soaker hose. Apply water at dripline or adjacent construction, not around trunk at base.

3.4 LANDSCAPE REPAIR

A. Contractor shall repair any damage to the existing irrigation system caused by the work and replace any portion of the existing irrigation system that is removed as a result of the work.

B. Contractor shall restore the site to existing grade except where shown or specified otherwise.

C. Except where shown or specified otherwise, any existing lawn area disturbed by the work shall be restored to existing grade and revegetated with sod of approved species.

D. Except where shown or specified otherwise, any existing groundcover area disturbed by the work shall be restored to existing grade and replanted with the same plants as those removed.

END OF SECTION 01 56 39

SECTION 01 57 30

STORM WATER POLLUTION PREVENTION

PART 1 - GENERAL

1.1 SCOPE

A. Discharge of pollutants (any substance, material, or waste other than clear, uncontaminated storm water) from the project into the storm drain system is strictly prohibited by the Regional Water Quality Control Board's (RWQCB) Water Quality Control Plan (Basin Plan).

B. Prime Trade Contractor to provide all material, labor, and equipment for installation, implementation, and maintenance of all surface-water pollution prevention measures. This work includes the following:

1. Furnishing, placing, and installing effective measures for preventing runoff of soil, silts, gravel, hazardous chemicals or other materials prohibited by the RWQCB from entering the storm water drainage system.

2. Management of on-site construction materials in such a manner as to prevent said materials from contacting storm water or wash water and running off into the storm drain system.

3. Complying with applicable standards and regulations specified herein. Any measures required to achieve these standards whether specifically shown in the Contract Documents or not shall be provided by the Prime Trade Contractor.

4. Maintain 1 copy of the most current revised Storm Water Pollution Protection Plan (SWPPP) at the Contractor's work site. Any revised or additional measures required to achieve these standards shall be added to the current SWPPP.

5. Review any changes in the SWPPP plan each week at the weekly meetings with the Construction Manager and others. At each weekly meeting, the Contractor shall submit a numbered checklist of the current status of each prevention measure on the job site.

C. In this section, the term "storm drain system" shall include but not limited to storm water conduits, storm drain inlets and other storm drain structures, street gutters, channels, and ditches.

D. Prime Trade Contractor shall have storm water pollution prevention measures in place and conduct inspections year-round. It is the responsibility of the Prime Trade Contractor to be prepared for a rain event in the non-rainy season, and to be aware of weather predictions. The District is not responsible for informing the Prime Trade Contractor of rain predictions.

E. Sanitary sewer blockages can result in a back-up and discharge to the storm drain system. Prime Trade Contractor shall immediately notify the Construction Manager if they become aware of a clogged sanitary sewer associated with the Project.

F. Prime Trade Contractor shall not allow any non-storm water from the Project to enter the storm drain system. Examples of non-storm water include water used for dust suppression, pipe flushing and testing, and domestic supply water used to wash streets, painting and drywall equipment, vehicles, or other uses.

G. Water resulting from de-watering an excavation may be discharged to a storm drain only if it is free of pollutants, including sediment. Prime Trade Contractor shall use methods such as a settling basin or filter to ensure that dewatering discharges are free of pollutants.

1.2 REGULATIONS AND STANDARDS

A. Prime Trade Contractor shall comply with the following applicable regulations, including all applicable amendments: Water Quality Act, State of California.

1. Regional Water Quality Control Board's Basin Plan, 1998 Edition.

2. Waste Discharge Requirements Order No. 2010-0014-DWQ (National Pollutant Discharge Elimination System (NPDES) Permit No. CAS000002) These Orders are referred to as the General Permit.

B. Prime Trade Contractor shall comply with the following standards and guidelines on storm drain pollution prevention:

1. California Stormwater Quality Association Handbooks – Construction, Municipal, Industrial and Commercial, and New Development and Redevelopment. These documents can be viewed and downloaded from the Association's website at http://www.cabmphandbooks.org.

1.3 SUBMITTALS

A. Submittals shall comply with requirements specified in Section 01 33 00 Submittal Procedures, Product Data and Samples.

B. Review the Storm Water Pollution Prevention Plan (SWPPP) prepared by [civil engineer] prior to ground breaking. The SWPPP contains all required elements specified in the General Permit using the SWPPP Template in Appendix B of the California Stormwater Quality Association – Stormwater Best Management Practice Handbook for Construction. This template can be downloaded from the California Stormwater Quality Association website at http://www.cabmphandboods.org/Construction.asp. The SWPPP has been developed to meet the following objectives:

1. To identify pollutant sources that may affect the quality of storm water discharges associated with construction activity from the construction site.

2. To identify non-storm water discharges.

3. To identify, construct, and implement storm water pollution prevention measures (Best Management Practices, or BMPs) to reduce or eliminate pollutants in storm water discharges from the construction site, both during construction and after construction is completed.

4. To develop a maintenance schedule for BMPs installed during construction designed to reduce or eliminate pollutants after construction is completed (post-construction BMPs).

5. Prime Trade Contractor shall notify the Construction Manager whenever there is a change in construction, operations or site conditions that may affect the discharge of pollutants to surface waters so that the SWPPP has been amended. All amendments should be dated and directly attached to the SWPPP.

6. The SWPPP shall include a site map and site-specific written plans that describes pollution sources for the construction activity and the methods that will be used for erosion and sediment control, hazardous materials management, and any other construction activity that are sources of pollution. The list of topics to be covered in the plan are included in Part 3 Execution of this Section.

C. Site work shall not commence until the SWPPP has been reviewed and accepted by the Construction Manager.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials as required for execution of the Work.

PART 3 - EXECUTION

3.1 GENERAL

A. The Prime Trade Contractor shall provide qualified personnel that will implement the District's SWPPP. The Prime Trade Contractor will choose the best available performance-based technology and methods to prevent storm water pollution for construction site activity. The method(s) chosen shall be appropriate for each specific site condition.

B. The Prime Trade Contractor will provide a Qualified SWPPP Practitioner (QSP) to make all required inspections and complete inspection checklist, using a form provided by the State Water Board or Regional Water Board. Prime Trade Contractor shall make all necessary corrections or changes noted on the inspection checklist.

3.2 SWPPP TOPICS

A. Following are topics addressed in the SWPPP:

1. Introduction/Site Description:

a. The SWPPP shall include basic information about the project including: size of site, type of construction, location of site, project start date and estimated completion date. The site description shall be updated to reflect changes in conditions which may reflect.

2. Maps:

a. The General Permit has specific map requirements, including a topographic map showing the location of nearby surface water bodies and the discharge location(s) for the site. A detailed site map is also required, which shall identify areas of soil disturbance, location of surface water bodies, areas of existing surface vegetation, location of sediment or pollutant control measures, site drainage patterns, areas used for storage of soils, waste, or materials, vehicle and equipment parking or service areas, existing paved areas and location of post-construction controls. The maps shall be updated as needed to reflect changes as the project progresses. The approved map and plan shall be kept onsite for reference by the Contractor, Construction Manager or governmental agencies.

3. Description of Site and Soil Types:
   a. Include the following estimates:
      1) The size of the construction site (in acres) ;
      2) The runoff coefficient of the site before and after construction;
      3) The percentage of the area of construction that is impervious before and after construction).

4. Pollutant Sources:
   a. List and describe pollutants that are likely to be present in storm water discharges from the site, such as sediment, waste materials, concrete, etc. Describe the locations of storage or use of such materials and the measures to prevent pollution.

5. Toxic Materials:
   a. Describe all toxic materials that will be used during construction, such as adhesives, paint, petroleum products, pesticides, and vehicle fluids. Describe the locations of storage or use of such materials and the measures to prevent pollution.

6. Erosion and Sediment Control:
   a. Provide a description of erosion and sediment control measures that will be used on the site, and correlate the description with the site map. Areas requiring erosion control measures are exposed soil, such as stockpiles, bare soil, sloped soil, and any area of disturbed soil. Erosion control measures include paving, tarp placement, soil blankets, mulching, seeding, hydro-mulching, and spreading straw. Sediment control measures include drain inlet protection, filter fabric, geo-textile silt fencing, gravel placement, gravel or sand bag placement, and straw wattle placement. This list is not all inclusive and the Prime Trade Contractor should refer to the resources listed in this section to identify the best measures for the project. Describe measures to reduce the tracking of sediment from the site. Describe waste disposal practices and methods to prevent waste materials from polluting storm water. Indicate the location of concrete washout areas. Both erosion and sediment control practices are designed to be implemented as an integrated system of pollution control. Without erosion controls, sediment controls are easily overwhelmed and will not prevent pollution.

7. Non-Storm Water Management:

a. Describe all non-storm water discharges that may occur on site. Examples of non-storm water discharges include irrigation runoff, street cleaning, spills, or leakage from storage tanks. Non-storm water discharges should be eliminated or reduced to the extent feasible. Discharges from dewatering are allowed only if they are free of pollutants, including sediment.

8. Maintenance, Inspection and Repair of Controls:
   a. Structural pollution controls require ongoing inspection, maintenance and repair. Prime Trade Contractor shall maintain all pollution control measures to achieve compliance with the SWPPP and General Permit. Describe procedures for responding to failure of any structural controls and indicate the persons responsible for inspection, maintenance and repair.
9. Spill Prevention and Control:
   a. Measures to prevent, control and respond to spills shall be described in the SWPPP. Prime Trade Contractor shall take precautions to prevent accidental spills of pollutants, including hazardous materials brought onsite by the Contractor. However, in the event of a spill, the Prime Trade Contractor shall be responsible for the following:
      1) Immediately contain and prevent leaks and spills of prohibited pollutants from entering the storm drain system. Clean up the spill and label the contained material. Store the container in a safe place and contact the Construction Manager prior to disposal of the waste by the Prime Trade Contractor. Prime Trade Contractor shall keep a spill kit on site at all times for this purpose. The Prime Trade Contractor shall also keep a sampling kit, with the spill kit. At a minimum, three appropriate vials for sampling.
      2) Prime Trade Contractor shall comply with all federal, state, and local hazardous waste requirements. Ensure that no spilled materials are washed into the streets, gutters, storm drains, or creeks.
      3) Report any hazardous or unknown material spills immediately to the Construction Manager. Refer to 2012 CASQA Handbook, WM-4 “Spill Prevention” for proper procedures and practices.
10. Post-Construction Stormwater Management
    a. Describe all the control practices to reduce pollutants in storm water discharges after the construction activities are completed at the site. Post construction BMPs include: minimizing land disturbance, minimizing impervious surfaces, treatment of storm water runoff using filtration, use of efficient irrigation systems, and planting to reduce erodible surfaces.
11. Personnel:
    a. Identify and describe the training of the personnel responsible for the implementation and monitoring of the SWPPP and BMPs. Documentation of training shall be available upon the request of the Construction Manager or a regulatory agency.
12. Notification List:
    a. Provide the company’s name, address and telephone number, along with a contact person’s name and telephone number for everyone responsible for

implementation of the SWPPP. The Prime Trade Contractor shall inform all subcontractors (if any) of the water pollution prevention requirements contained in this specification and the site-specific SWPPP and include appropriate subcontract provisions to ensure that these requirements are met.

13. Monitoring and Reporting:

    a. The SWPPP shall describe the monitoring Construction to ensure compliance with the General Permit. The monitoring plan shall include site inspections and the Prime Trade Contractor's QSP shall conduct inspections of the construction site weekly, prior to anticipated storm events, during extended storm events, and after actual storm events to identify areas contributing to a discharge of storm water associated with construction activity. The name(s) and contact number(s) of the assigned QSP inspection personnel shall be listed in the SWPPP. Weekly and pre-storm inspections are to ensure that BMPs are properly installed and maintained; post-storm inspections are to assure that the BMPs have functioned adequately. The Prime Trade Contractor should also be inspecting BMPs regularly; prior to and after storm events to insure they are installed and maintained. During extended storm events, inspections by the QSP shall be required each 24-hour period. BMPs shall be evaluated for adequacy and proper implementation and whether additional BMPs are required in accordance with the terms of the General Permit.

    b. Inspections by the QSP must be documented and the records maintained onsite for review by the Construction Manager or regulatory agencies. If instances of non-compliance with the General Permit are identified, the Prime Trade Contractor shall notify the Construction Manager immediately. Corrective measures should be implemented immediately following discovery of an exceedance of water quality standards or other instance of non-compliance.

    c. The QSP shall prepare all required regulatory notifications and reports including but not limited to exceedance notifications and annual or quarterly reports. This shall include annual reports submitted for any work completed during the reporting period. Uploading the reports and notifications to the RWQCB's Storm Water Multiple Application and Report Tracking System (SMARTS) shall be coordinated with the LRP to assure all reports and notifications are uploaded and approved by the LRP in the required notification period.

3.3 ENVIRONMENTAL ENFORCEMENT

A. The RWQCB has authority to enforce, through codified regulations, any portions of this Section that may violate applicable regulations. Agency enforcement may include but is not limited to: citations, orders to abate, bills for cleanup costs and administration, civil suits, and/or criminal charges. Contract compliance action by the District shall not be construed to void or suspend any enforcement actions by these or other regulatory agencies.

B. Prime Trade Contractor shall notify the Construction Manager within 24 hours after issuance of any citation(s) issued by any regulatory agency and shall be responsible for

all fines and costs necessary to correct the conditions listed in the citation(s) to include all legal fees and District expenses.

END OF SECTION 01 57 30

SECTION 01 60 00

PRODUCT REQUIREMENTS AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections:

1. Section 01 77 10 "Closeout Procedures" for submitting warranties for Contract closeout.
2. Divisions 2 through 49 Sections for specific requirements for warranties on products and installations specified to be warrantied.

1.3 DEFINITIONS

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

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

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

1. The following are not considered substitutions:

a. Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by bidders during bidding period. If accepted by Architect during bidding period, such changes are considered part of Contract Document requirements, and are

not subject to procedural requirements specified in this Section for product substitutions.

1.4 SUBMITTALS

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

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.

2. Form: Tabulate information for each product under the following column headings.

a. Specification Section number and title.

b. Generic name used in the Contract Documents.

c. Proprietary name, model number, and similar designations.

d. Manufacturer's name and address.

e. Supplier's name and address.

f. Installer's name and address.

g. Projected delivery date or time span of delivery period.

h. Identification of items that require early submittal approval for scheduled delivery date.

3. Architect's Action: Architect will respond in writing to Contractor within 10 working days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

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

1. Substitution Request Form: Use standard form provided by Owner.

a. Attach Substitution Warranty form.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.

b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within five working days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 5 working days of receipt of request, or five working days of receipt of additional information or documentation, whichever is later.

   a. Form of Acceptance: Change Order.

   b. Use product specified if Architect cannot make a decision on use of proposed substitution within time allocated.

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

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within five working days of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 10 working days of receipt of request, or five working days of receipt of additional information or documentation, whichever is later.

   a. Form of Approval: As specified for action submittals in Section 01 33 00 "Submittal Procedures."

   b. Use products specified if Architect cannot make a decision on use of a comparable product request within time allocated.

1.5 QUALITY ASSURANCE

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

1. Each Contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between Contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

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

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

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

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Warranty Requirements:

1. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
2. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall extend and be equal to the original warranty with an equitable adjustment for depreciation.
3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. Replace or rebuild defective Work regardless of whether Owner has benefited from use of the Work through a portion of its anticipated useful service life.
4. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which Owner can enforce such other duties, obligations, rights, or remedies.
    a. Rejection of Warranties: Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
    b. Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

D. Submittal Time: Comply with requirements in Section 01 77 10 ”Closeout Procedures.”

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term “as selected,” Architect will make selection.
5. Where products are accompanied by the term “match sample,” sample to be matched is Architect’s.
6. Descriptive, performance, and reference standard requirements in the Specifications establish “salient characteristics” of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements. Comply with provisions in Part 2 “Product Substitutions” Article for consideration of an unnamed product.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comply with provisions in Part 2 “Product Substitutions” Article for consideration of an unnamed manufacturer.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products that complies with requirements. Comply with provisions in Part 2 “Product Substitutions” Article for consideration of an unnamed product.
4. Manufacturers: Where Specifications include a list of manufacturer’s names, provide a product by one of the manufacturers listed that complies with requirements. Comply with provisions in Part 2 “Product Substitutions” Article for consideration of an unnamed manufacturer.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 “Comparable Products” Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed

manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

7. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 Article "Product Substitutions" of this Section for proposal of product.
8. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 35 working days after the Notice to Proceed Requests received after that time will not be considered.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of testing and inspection, increased cost of other construction by Owner, and similar considerations. Cost of Owner's additional responsibilities will be deducted from Contract Sum by Change Order.
        a. Substitution request will not be considered if necessitated by failure to pursue the Work promptly or coordinate activities in a timely manner.
    2. Requested substitution does not require extensive revisions to the Contract Documents.
    3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    4. Substitution request is fully documented and properly submitted.
    5. Requested substitution will not adversely affect Contractor's Construction Schedule.

6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

C. Submittal procedures as specified in Section 01 33 00 ”Submittals Procedures,” do not constitute an acceptable method of requesting substitutions. Architect’s review of such submittals does not constitute approval of substitutions that may be contained therein.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor’s request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require extensive revisions to the Contract Document, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 71 23

FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include:

1. Section 01 31 13 ”Project Management and Coordination” for procedures for coordinating field engineering with other construction activities.
2. Section 01 33 00 ”Submittal Procedures” for submitting surveys.
3. Section 01 73 29 ”Cutting and Patching” for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Section 01 77 10 ”Closeout Procedures” for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 REFERENCES

A. NFPA 241: Safeguarding Construction, Alteration, and Demolition Operations.

1.4 SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two copies showing the Work performed and record survey data.

E. Final Property Survey: Submit five copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work.

b. List of detrimental conditions, including substrates.

c. List of unacceptable installation tolerances.

d. Recommended corrections.

2. Verify compatibility with and sustainability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a Request For Information to Engineer in accordance with Section 01 31 13 “Project Management and Coordination.” Include a detailed description of problem encountered, together with recommendations for modifications, if needed.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmark. If discrepancies are discovered, notify Engineer, Project Inspector, and Construction Manager immediately upon discovery.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Engineer, Project Inspector, and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer, Project Inspector, and Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points, without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer and Construction Manager before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land

surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements, and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official “property survey.”

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of eight feet in spaces without a suspended ceiling.

B. Comply with manufacturer’s written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
2. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Pre-installation Conferences: Include Owner's construction forces at pre-installation conferences covering portions of the Work that are to receive Owner's work. Attend pre-installation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements of NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
4. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

B. Site: Maintain Project site free of waste materials and debris. Do not dispose of material on site,

1. Dust Control: Palliate dust conditions throughout duration of Project for entire area of work and surrounding site by watering and sprinkling as required to allay dust.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health of property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration as Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest. Project Inspector shall witness.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Project Inspector shall witness. Replace damaged and malfunctioning controls and equipment.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 73 29 ”Cutting and Patching.”

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 71 23

SECTION 01 73 20

DEMOLITION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section includes selective demolition, alteration and remodeling work indicated or required to produce finished results shown and includes the following:

1. Demolition and removal of selected portions of a building.

2. Demolition and removal of selected site elements.

3. Patching and repairs.

1.2 RELATED SECTIONS

A. Section 01 51 10: Utility Shutdown

B. Section 01 56 10: Dust Control Measures

C. Section 01 73 29: Cutting and Patching

D. Section 01 74 19: Construction Waste Management and Disposal

E. Section 01 77 00: Closeout Procedures

F. Divisions 22 and 23 Sections for cutting, patching, or relocating mechanical items.

G. Division 26 Sections for cutting, patching, or relocating electrical items.

1.3 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to

a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.5 SUBMITTALS

A. Comply with pertinent portions of Section 01 33 00.

B. Prior to cutting which affects structural safety, submit written request to the Architect for permission to proceed with cutting.

C. Record Drawings: Submit at project closeout according to Sections 01 77 10 and 01 78 00.

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1. Comply with California Building Code, Title 24, Part 9, California Fire Code, Chapter 14, Fire Safety During Construction and Demolition.

1.7 PROJECT CONDITIONS

A. Occupancy: Owner may occupy portions of the building immediately adjacent to alteration areas. Conduct alteration work in manner that will minimize need for disruption of Owner's operations. Provide minimum 72 hours advance notice to Owner of demolition activities that will affect Owner's operations.

B. Owner assumes no responsibility for actual condition of buildings to be altered.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Asbestos or Hazardous Waste: It is understood asbestos and hazardous abatement is included in this Work as defined in the Report provided with these documents. If additional asbestos and/or hazardous material, above that reported is encountered,

notify the Program Manager immediately. Do not disturb, handle or attempt to remove.

D. Traffic: Conduct demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

1. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

PART 2 - PRODUCTS

2.1 PRODUCTS FOR PATCHING, EXTENDING AND MATCHING

A. Provide same products or types of construction as that in existing structure, as needed to patch, extend or match existing work.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

2. Use materials whose installed performance equals or surpasses that of existing materials.

3. Generally Contract Documents will not define products or standards of workmanship present in existing construction; Contractor shall determine products by inspection and any necessary testing, and workmanship by use of the existing as a sample of comparison.

B. Presence of a product, finish, or type of construction, requires that patching, extending or matching shall be performed as necessary to make work complete and consistent to identical standards of quality.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing conditions, including elements subject to movement or damage during remodeling work.

B. After uncovering the work, examine conditions affecting installation of new work.

C. Discrepancies:

1. If uncovered conditions are not as anticipated, immediately notify the Architect and secure needed directions.

2. Do not proceed in areas of discrepancy until such discrepancies have been fully resolved.

D. Time extensions or increase or decrease of costs resulting from such changes will be adjusted in the manner provided in the General Conditions.

3.2 UTILITY SERVICES

A. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

2. Provide not less than 72 hours notice to Owner if shutdown of service is required during changeover.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.

2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building or Campus before proceeding with selective demolition.

3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

C. Utility Requirements: Refer to Divisions 22, 23, and 26 for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by for public safety.

2. Protect existing site improvements, appurtenances, and landscaping to remain.

3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

4. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.

5. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.

B. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement or collapse of structures to be selectively demolished.

1. Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

2. Strengthen or add new supports when required during progress of selective demolition.

C. Cover and protect furniture, furnishings, equipment and fixtures that have not been removed.

D. Provide and maintain barricades and guard rails as required by applicable regulatory agency to protect occupants of building and workers.

E. Where demolition, removal or rework occurs, take all necessary precautions to protect finished work from damage. Finished work damaged by operations under this contract shall be repaired or replaced to the acceptance of Owner and Architect at no extra cost to the Owner.

3.4 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE DEMOLITION, ALTERATIONS

A. Cut, drill, alter, remove, or temporarily remove and replace existing construction as necessary for performance of work under the contract. Work that is replaced shall match similar existing work.

B. Unless otherwise noted on the drawings or specified do not cut or alter structural

members without authorization of the Architect or Structural Engineer.

C. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations.

   1. Repair all demolition performed in excess of that required, at no cost to the Owner.

D. Work remaining in place, which is damaged or defaced during this contract, shall be restored to the condition at time of award of contract.

E. If removal of existing work exposes discolored or unfinished surfaces, or work out of alignment, refinish such surfaces or replace the material as necessary to make contiguous work uniform.

F. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

G. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

H. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations. Contractor to provide a fire watch as per NFPA.

I. Maintain adequate ventilation when using cutting torches.

J. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

K. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

L. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

M. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.

N. Cut finish surfaces such as concrete, masonry, tile, plaster or metals, by methods to terminate surfaces in a straight line at a natural point of division.

O. Where new work joins existing construction, ensure that joinings are weathertight, sound and even in appearance.

P. Fixtures and outlets to be removed shall have their utility lines capped within walls or floors. Utility lines encountered in the work shall be capped, extended or reworked as necessary for completion of alterations.

3.6 DISPOSITION OF MATERIALS

A. Promptly remove from the site all materials resulting from demolition and alteration which are not to be reused.

B. Burning of materials on site is not permitted.

C. Store items to be reused in a protected location until reinstallation.

D. Disposal: Transport demolished materials off Owner's property and legally dispose of them in accordance with Section 017320.

END OF SECTION 01 73 20

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Requirements of this Section apply to construction activities of each Prime Contractor.

1. The term “Contractor” as used in this Section, applies to each Prime Contractor.

C. Related Sections include:

1. Divisions 2 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 5 working days before time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components and other significant visual elements.
3. Products: List products to be used and firms or entities and other significant visual elements.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that

will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Engineer's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. Structural elements include, but are not limited to:

1. Foundation construction.
2. Bearing and retaining walls.
3. Structural concrete.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Communication systems.
3. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Piping, ductwork, vessels, and equipment.
4. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Engineer's opinion, reduce the site's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 2 & Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, ductwork, and similar features before paint or other finishes are applied.

END OF SECTION 01 73 29

SECTION 01 74 17

SITE MAINTENANCE AND CLEANUP

PART 1 - GENERAL

A. Conduct daily inspections, and more often if necessary, to verify that requirements for project cleanliness are being met. In addition to the standards described in this section, comply with pertinent requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

B. A Street Sweeper shall be provided for street sweeping, by the Contractor, where street sweeping is required due to waste generated by this contract.

PART 3 - EXECUTION

A. Maintain the site in a neat and orderly condition at all times, allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.

B. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material, and remove such items to the place designated for their storage. Do not allow accumulation of scrap, debris, waste material, and other items not required for construction of the work. At least once a week, and as directed by the Architect, completely remove all scrap, debris, and waste material from the job site.

C. Roadways on which construction is taking place shall be cleaned and swept of all materials attributed to or involved in the work with a mechanical street sweeper at least daily, or more often when specified in these Specifications or if ordered by the Program Manager. In addition, clean adjacent streets with an approved mechanical street sweeper at least once a week on Fridays.

D. Prior to completion of the work, remove from the job site all tools, surplus materials and soil, equipment, scrap, debris, and waste. Perform final cleaning of paved areas on the site with a mobile street sweeper and completely remove resultant debris. Schedule final cleaning prior to final inspection to enable the District to accept a completely clean project site.

E. Remove weeds, as necessary but at a minimum monthly by no chemical means.

F. Payment:
   1. Full compensation for furnishing all labor, materials, tools and incidentals for doing all work for site maintenance and cleanup shall be included in other items of work and no separate payment will be made.

END OF SECTION 01 43 00

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Outline of waste minimization plan required by the Contractor.

1.2 RELATED SECTIONS

A. Section 01 57 30: Storm Water Pollution Prevention

B. Section 01 73 20: Demolition Procedures

C. Section 01 74 17: Site Maintenance and Cleanup

1.3 GENERAL REQUIREMENTS

A. It is the policy of the District that all construction projects adhere to the highest environmental standards. All construction should use resources wisely, minimize waste generation and maximize recovery of wastes that are generated. The Contractor shall prepare a waste minimization plan to prevent wastes on-site and to keep at least 50 percent by weight of all wastes out of the landfill.

The Owner has established that this Project shall generate the least amount of waste possible and that processes shall be employed that ensure the generation of as little waste as possible. These shall include prevention of damage due to mishandling, improper storage, contamination, inadequate protection or other factors as well as minimizing over packaging and poor quantity estimating.

Of the inevitable waste that is generated, the waste materials designated in this specification shall be salvaged for reuse and or recycling. Waste disposal in landfills or incinerators shall be minimized. On new construction projects, this means careful recycling of job site waste, on demolition projects this also means careful removal for salvage.

B. The plan should include the following information:

1. Categories of materials which will be reused or recycled, recorded in cubic yards or tons. To the maximum extent feasible, the following material types should be recovered: concrete, dimensional lumber, cardboard and paperboard, metals (i.e. framing, ductwork, plumbing and wire), asphalt, roofing materials, wood pallets and beverage containers, old corrugated cardboard, clean dimensional wood & palette wood, concrete/brick/concrete block/asphalt, scrap metal, drywall, land clearing debris, paint (return to hazardous waste depot), list of optional materials to be salvaged (demolition projects only), dimensioned lumber and heavy timbers, wood

siding, structural steel, wood paneling, molding, trim and wainscoting, heritage architectural elements such as mantle pieces, columns, etc., cabinets and casework, insulation, where suitable, brick and block, electric equipment and light fixtures, plumbing fixtures and brass, windows, doors and frames with historic value, hardwood flooring.

a. When practical, the Contractor should also recover the following material types for reuse or recycling: carpet and carpet padding, particleboard and OSB, PVC, drywall, plywood and insulation.

b. Hazardous wastes shall be separated, stored, and disposed of in accordance with the requirements of the authorities having jurisdiction, including Federal, State, County and City agencies.

2. Name of the hauler(s) used to remove wastes and recyclables from the site.

3. Actual destination for all used and excess materials – landfilled or diverted.

4. Actual quantities of used and excess materials landfilled and diverted.

5. Submit to the Owner way-bills, invoices and other documentation confirming that all materials have been hauled to the required locations. Way bills may be requested by the building authority.

C. As an attachment to this section, the Construction Waste Minimization Plan and the Construction Monthly Waste/Recycling Report have been included for your information and submission.

1.4 PLAN APPROVAL

A. Submit the initial Waste Minimization Plan to the District **within 20 days of the Notice-to-Proceed**. District staff shall review the Plan and suggest revisions before construction begins. Contractor shall implement the Plan as proposed, unless the District and Contractor agree, in writing, to modifications.

B. The Contractor shall distribute copies of the Waste Minimization Plan to the Job Site Foreman and each Subcontractor. The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling to be used by all parties at the appropriate stages of the Project. On demolition projects, the Contractor shall provide on-site instructions for salvage and requirements for reusing salvaged materials within the project, either in new construction or in a renovation.

1.5 PLAN ENFORCEMENT

A. Elements of the Plan's implementation shall be evaluated during building site inspections.

[CONTINUED ON NEXT PAGE]

1.6 MONTHLY AND FINAL REPORTS

A. The Contractor shall submit the Monthly Waste/Recycling Report to the District on progress made toward meeting the conditions of the Waste Minimization Plan, plus a final report at the end of the project. In the event that a project proceeds over multiple calendar years, monthly reports and an annual report shall be submitted for each calendar year of the project.

B. Monthly and final reports shall consist of a copy of the originally-submitted Waste Minimization Plan, with actual tonnages or volumes of landfilled and diverted materials reported, to date. Final or annual reports shall provide the cumulative total material weights for the project or for the calendar year. Copies of recovery or disposal site gate tickets, indicating material weight at the facility, must accompany actual data. Invoices and truck hauling receipts are not acceptable.

C. A Monthly Waste/Recycling Report must be submitted with each payment application. It is required prior to the District approving the payment application.

D. Approval of the final report is required prior to the District making the last payment for services.

E. Monthly Waste/Recycling Reports must be submitted regardless if waste was pulled from the site. The contractor can simply indicate that no material was disposed.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

[CONTINUED ON NEXT PAGE]

WEST VALLEY-MISSION COMMUNITY COLLEGE DISTRICT
CONSTRUCTION WASTE MINIMIZATION PLAN

Instructions: Contractor shall provide the following information to the District within 20 days of Notice-to-Proceed, per the Contract Documents.

Contractor Company:		Contact Person Name:	
Business Address:		Contact Phone#	
Measure C Project #:		Contact E-Mail:	

PROJECT DESCRIPTION/WORK TO BE PERFORMED:

Material Type	**Estimated Amount** (volume or tons)	**Hauler**	**Destination**	**Actual*** Amount Landfilled (volume or tons)	**Actual*** Amount Diverted (volume or tons)
Dirt & Clean Fill					
Asphalt					
Concrete					
Scrap Metal					
Wood					
Drywall					
Fixtures					
Roofing					
Carpet & Padding					
Cardboard					
Beverage Containers					
Trash					
Other (specify):					
TOTALS					

* Actual amounts to be completed as part of the Quarterly and Final Reports.

I, as a responsible person, to the best of my abilities, certify that this project will conform to the District's policy that all construction projects will adhere to the highest environmental standards. I certify that this project will use resources wisely, minimize waste production, maximize recovery of wastes, and maximize the use of recycled content materials.

_____ _____

Signature of Responsible Person Date

WEST VALLEY-MISSION COMMUNITY COLLEGE DISTRICT
CONSTRUCTION MONTHLY WASTE/RECYCLING LOG

Instructions: Contractor shall provide the following information to the District with each pay application as per the contract documents.

Contractor Company:		Contact Person Name:	
Business Address:		Contact Phone#	
Measure C Project #:		Contact E-Mail:	
MONTH-YEAR:			

Material Type	**Ticket Number***	**Hauler**	**Destination**	**Amount Landfilled** (volume or tons)	**Amount Diverted** (volume or tons)
Dirt & Clean Fill					
Asphalt					
Concrete					
Scrap Metal					
Wood					
Drywall					
Fixtures					
Roofing					
Carpet & Padding					
Cardboard					
Beverage Containers					
Trash					
Other (specify):					
TOTALS					

* Copies of recovery or disposal site gate tickets, indicating material weight at the facility, must accompany actual data.

_____ _____

Signature of Responsible Person Date

END OF SECTION 01 74 19

SECTION 01 77 10

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Warranties.
   3. Final cleaning.
   4. Closeout documentation.

B. Requirements of this Section apple to each Prime Contractor.
   1. The term “Contractor” as used in this Section, applies to each Prime Contractor.

C. Related Sections include:
   1. Section 01 29 00 ”Payment Procedures” for requirements for Applications for Payment for Substantial and Final Completion.
   2. Section 01 71 23 ”Field Engineering” for progress cleaning of Project site.
   3. Section 01 78 00 ”Project Record Documents” for submitting Record Drawings, Record Specifications, and Record Product Data.
   4. Divisions 2 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
   1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
      a. Architect will not perform re-inspection until assurance can be provided that incomplete items have been completed.
         i) Compensation for Architect's time in performing more than one re-inspection will be deducted from Contract Sum by Change Order.
   2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
   2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by

Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Submit the following:
    a. DSA Form DSA-6, Final Verified Report, fully executed and signed by Contractor, indicating 100% completion.
    b. Outstanding Change Orders, signed by Contractor.
    c. Testing and Inspection Reports for those tests and inspections designated as responsibility of Contractor.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
    1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
        a. Architect will not perform re-inspection until assurance can be provided that incomplete items have been completed.
            i) Compensation for Architect's time in performing more than one re-inspection will be deducted from Contract Sum by Change Order.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit 3 copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
    1. Organize list of spaces in sequential order, starting with exterior areas first, and proceeding from lowest floor to highest floor.
    2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
    3. Include the following information at the top of each page:
        a. Project name.
        b. Date.
        c. Name of Architect and Construction Manager.
        d. Name of Contractor.
        e. Page number.

1.6 WARRANTIES

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

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

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

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

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

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

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, or rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove labels that are not permanent.

g. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

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

h. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

i. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Remove waste materials for Project site and dispose of lawfully.

END OF SECTION 01 77 10

SECTION 01 78 00

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

B. Related Sections include:

1. Section 01 77 10 ”Closeout Procedures” for general closeout procedures.
2. Divisions 2 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up Record Prints, and one set of copies of marked-up Record Prints.

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

C. Miscellaneous Record Submittals: Submit one set as specified in Part 2.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of prints of the Contract Drawings and Shop Drawings.

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

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an understandable drawing technique.

c. Record data as soon as possible after actual work item has been completed. Record and check the markup before enclosing concealed installations.

d. Record drawings will be verified by Construction Manager for update status in conjunction with monthly pay applications. Record drawings must be updated to current status as a requirement for payment application approval.

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

   a. Dimensional changes to Drawings.

   b. Revisions to details shown on Drawings.

   c. Locations and depths of underground utilities.

      i) Indicate sizes and invert elevations of piping below grade

      ii) Indicate sizes of conduit below grade.

      iii) Indicate exact locations and sizes of plugged wyes, tees, caps, and manholes.

      iv) Indicate locations of valves, pull boxes, and pull boxes.

      v) Indicate specific conduit pathways for each type of cabling route from initial point of termination to the final point of termination.

   d. Revisions to routing of piping and conduits.

   e. Revisions to electrical circuitry.

   f. Changes made by Engineer's Supplemental Instruction, Change Order, Construction Change Directive, Request for Information, or other written directive from Engineer. Note corresponding reference numbers for each item.

   g. Details not on the original Contract Drawings.

   h. Field records for variable and concealed conditions.

   i. Record information on the Work that is shown only schematically.

3. Indicate location and layout of items by measured dimension to building corners or other permanent features.

4. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

5. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

6. Mark important additional information that was either shown schematically or omitted from original Drawings.

7. Note the following, where applicable:

a. Post RFI's on backside of adjacent plan sheet to indicate modifications to original design and indication of new design modification.

b. Addenda item numbers.

c. Alternate numbers.

d. Change Order numbers.

e. Construction Change Directive numbers.

f. Supplemental Instruction numbers.

g. Request for Information numbers.

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

a. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

b. Identification: As follows:

i) Project name.

ii) Date.

iii) Designation "PROJECT RECORD DRAWINGS."

iv) Name of Engineer and Construction Manager

v) Name of Contractor.

2.2 RECORD SPECIFICATIONS

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

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Project Data has been submitted in operation and maintenance manuals.

5. Note the following, where applicable:

a. Addenda item numbers.

b. Alternate numbers.

c. Change Order numbers.

d. Construction Change Directive numbers.

e. Supplemental Instruction numbers.

f. Request for Information numbers.

2.3 RECORD PRODUCT DATA

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

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note the following, where applicable:
   a. Addenda item numbers.
   b. Alternate numbers.
   c. Change Order numbers.
   d. Construction Change Directive numbers.
   e. Supplemental Instruction numbers.
   f. Request for Information numbers.

2.4 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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

B. Submit a complete hard copy set and an electronic copy in the latest version of AutoCAD of As-Built Drawings at the completion of the project. Indicate separate types of cabling with separate contrasting colors (i.e. Communications, Fire Alarm, CATV, etc.).

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

1. Record documents are to be maintained continuously in a state of completion reflecting current progress of completed Work at all times. Applications for Payment as specified in Section 01 29 00 "Payment Procedures," will not be processed until Architect has verified record documents are fully updated.

END OF SECTION 01 78 00

SECTION 01 91 13
GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Scope of systems and equipment to be commissioned.
2. Commissioning duties and procedures at the site.

1.2 RELATED SECTIONS

A. Division 01, General Requirements applies to this Section.
B. Contents of Division 23, HVAC and Division 26, Electrical apply to this Section.
C. In addition, reference the following:

1. 23 08 00, Commissioning of HVAC
2. 26 08 00, Commissioning of Electrical

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by:

1. Division 01, General Requirements.
2. 23 08 00, Commissioning of HVAC
3. 26 08 00, Commissioning of Electrical

B. Current edition of the ASHRAE Guideline 0, The Commissioning Process.

1.4 SUBMITTALS

A. Submittals as required by:

1. Division 01, General Requirements.
2. 23 08 00, Commissioning of HVAC
3. 26 08 00, Commissioning of Electrical

1.5 DEFINITIONS

A. Commissioning Authority: The Commissioning Authority is the person or entity referred to throughout the Contract Documents as if singular in number who works with the Owner's Representative under a separate Contract.
B. Commissioning:

1. Commissioning is a process for achieving, verifying, and documenting that performance of a building and its various energy consuming systems meets the Design Engineer's design intent and the Owner's operational needs.
2. Commissioning includes tests for the operation of equipment and building systems to ensure that they operate as designed by the Design Engineer, and meet the needs of the building throughout the entire range of operating conditions.

3. Commissioning is a cooperative effort that requires participation by the Owner's Representative, General Contractor, system and equipment installers, building automation system installer, Testing and Balancing Agency, equipment manufacturers' representatives, Architect, Architect's design engineers, and Commissioning Authority.

C. Owner's Project Requirements (OPR): Document that details the functional requirements and expectations of how the building will be used and operated. This may include project location, goals, cost considerations, equipment manufacturers, and environmental control requirements.

D. Basis of Design (BOD): A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines.

E. Commissioning Procedures:

1. Inspection and testing procedures that are written by the Commissioning Authority for equipment and systems within the scope of commissioning.
2. Inspection checklists typically address items of installation compliance with design intent and approved submittals.
3. Functional performance test procedures typically address all sequences for normal and emergency equipment and system operation. These procedures consist of a mix of One-Time Tests and Continuous Measurement.
4. One-Time Tests: Functional performance tests of equipment and systems that are performed by forcing specific conditions that are intended to trigger specific responses, per the design intent.

F. Continuous Measurements:

1. Functional performance tests of equipment and systems that are performed by observing parameters of normal operation over an extended period. This is typically accomplished by means of the BAS trend logging capabilities, by monitoring with stand-alone data logging equipment, or by some combination of both.
2. Temperature conditions in occupied spaces, control stability, and lighting levels in areas with daylighting controls are three typical subjects of continuous measurement.

G. Commissioning Plan: The document, provided by the Commissioning Authority, that states the required tests for all equipment and systems within the scope of commissioning.

H. Commissioning Meetings: Issues related to commissioning will be discussed as required during regularly scheduled progress meetings.

1.6 PERFORMANCE REQUIREMENTS

A. Testing, inspecting and performance monitoring tasks specified in this Section and in Section 23 08 00, Commissioning of HVAC and Section 26 08 00, Commissioning of Electrical, are the responsibility of the Commissioning Authority, unless specifically indicated otherwise, and not part of the General Construction Contract. These tasks are included in these Sections for the Contractor's information, so the Contractor can understand the standards of system performance that are required and more effectively coordinate with the process of commissioning.

B. The Commissioning Authority will verify for the Owner's Representative that commissioned mechanical, plumbing, electrical, and controls system function interactively and in compliance with the Project design intent, and to facilitate orderly and efficient transfer of building operating systems to the Owner.

C. Commissioning does not relieve the Contractor of Contract obligations.

1.7 EQUIPMENT AND SYSTEMS TO BE COMMISSIONED

A. Systems:

1. HVAC Equipment
2. HVAC Controls
3. Lighting Controls (LCP, Daylighting, Occupancy Sensors)

1.8 COMMISSIONING DUTIES

A. Duties of Owner: Provide the OPR to the Architect/Engineer and Commissioning Authority prior to design development.

B. Duties of Architect:

1. Attend commissioning portion of Progress Meetings as necessary.
2. Lead the design team in assisting the resolution of deficiencies.

C. Duties of Architect's Mechanical Engineer:

1. Attend commissioning portion of Project Meetings as necessary.
2. At the request of either the Owner's Representative or the Commissioning Authority, review Commissioning Procedures and submit comments to Owner's Representative.
3. Develop and provide the Basis of Design to Owner and Commissioning Authority prior to 50 percent CD.
4. Assist in resolution of problems and deficiencies that are discovered during commissioning.
5. Perform all construction checklists and provide copies of completed signed construction checklists.

D. Duties of Architect's Electrical Engineer:

1. Attend commissioning portion of Project Meetings as necessary.
2. At request of either the Owner's Representative or the Commissioning Authority, review Commissioning Procedures and submit comments to Owner's Representative.
3. Develop and provide the Basis of Design to Owner and Commissioning Authority prior to 50 percent CD.

4. Assist in resolution of problems and deficiencies that are discovered during commissioning.

E. Duties of Commissioning Authority:

1. Attend commissioning portion of Project Meetings as necessary, minimum two meetings.
2. Provide plan to Owner's representative for review and comment.
3. Prepare commissioning procedures for each commissioned system based on actual system configuration.
4. Commissioning Procedures written by Commissioning Authority will include, in field data collection format, the detailed test procedures, test conditions, and criteria for acceptance of test results.
5. Submit any commissioning procedures that are written by Commissioning Authority to the Owner's Representative for review and approval at least one week prior to scheduled field Testing.
6. Provide personnel experienced in technical aspects of each system to be commissioned for execution of tests.
7. BAS Sequence Demonstration:

    a. Witness the Control Contractor's demonstration of their sequence tests.
    b. If any of the demonstrated sequences fails to operate per the controls submittal, witness the repeat demonstration after corrective action has been taken.

8. Execute the Commissioning Procedures.
9. Prepare and submit Observation Reports and Deficiency Reports as required, but within three days of noting any deficiency.
10. Submit to Owner's Representative a weekly written report of commissioning progress, unresolved deficiencies, and projected inspection, and test schedule during field testing.
11. Take the lead in timely evaluation of deficiencies, and advise Owner's Representative on resolution.
12. Assist in resolving commissioned system disputes by performing research to determine the scope of the dispute, and informing the involved parties on possible solutions to disputes.
13. Verify that the Owner's maintenance personnel are adequately trained as per the Contract Documents and the OPR.
14. Prepare a Commissioning Report that includes a summary of overall commissioning process, including deficiencies found, deficiency corrections, unresolved deficiencies, approved equipment and systems, discrepancies between final design intent and as-built systems, completed commissioning checklists, test documentation, and other commissioning documentation.
15. Develop a Systems Manual which describes system descriptions, sequence of operations, general maintenance requirements and intervals, recommended sensor calibration and energy efficiency best practices.

F. Duties of General Contractor:

1. Attend commissioning portion of Project Meetings as necessary, minimum four meetings.
2. Participate in resolution of problems and deficiencies that are discovered during commissioning.

3. Coordinate and direct system installers in executing their commissioning tasks.
4. Coordinate with Commissioning Authority on integration of construction and commissioning schedules.
5. Oversee and perform documentation requirements for all Pre-Functional Checklists.
6. Notify Commissioning Authority when all the following has been achieved. It is permissible, with prior approval by Commissioning Authority, to provide notification for individual systems as the following are all completed for each system.

    a. All controls point-to-point and sequence checkout is complete.
    b. All test and balancing is complete.
    c. Normal equipment schedules have been activated
    d. All control overrides and temporary valves have been returned to normal automatic' control.
    e. All manual isolation valves have been left open.
    f. Piping and duct systems have been cleaned and tested.
    g. Heating water system is fully operational under normal automatic operation.
    h. Luminaires are installed with operational daylighting controls and occupancy sensors.
    i. Distribution boards, including overcurrent devices, containing breakers over 600 amps, are installed.
    j. Building inspector acceptance of emergency lighting system following their site inspection.

7. Provide all startup, flushing, pressure testing, etc results/reports for commissioned systems.

G. Duties of Installer's and Manufacturer's Representatives:

1. Attend commissioning portion of Project Meetings as necessary.
2. Participate in resolution of problems and deficiencies that are discovered during commissioning.
3. Within three months of the award of the Contract, as part of the required submittals for the contract, Contractor submits manufacturer's startup and installation procedures as well as controls point-to-point and sequence checkout and provides in checkset format for each piece of equipment and controls.
4. Assist Commissioning Authority by completing certain sections of the Commissioning Procedures.
5. Commissioning does not relieve installers from obligations to complete Work as required by Contract Documents.

H. Duties of BAS Installer:

1. Attend commissioning portion of project meetings as necessary, minimum two meetings.
2. Review and approve Commissioning Procedures as relevant to controls work.
3. Point-to-Point Checkout:

a. Perform point-to-point checkout and calibration of all energy management system points.
b. Checkout and calibration on forms as approved by mechanical designer, and/or Commissioning Authority.
c. Submit three copies of the completed point-to-point checkout forms to the Owner's Representative within five working days of completion of field checkout. Distribute copies to the Commissioning Authority and the designer.

4. Control Sequence Testing:

   a. Prepare control sequence test procedure forms of a degree of rigor comparable to the Commissioning Authority's Commissioning Procedures.
   b. Submit test procedure forms to the Commissioning Authority for approval at least two weeks prior to intended sequence testing. At the contractor's option, it is acceptable to use the Commissioning Authority's Commissioning Procedures, substituting one-time tests for continuous measurement wherever applicable. However, it is still necessary to submit any edited Commissioning Authority Commissioning Procedures as least two weeks prior to intended sequence testing.
   c. Submit the completed sequence testing forms to the Owner's Representative. The Owner's Representative distributes copies to the Commissioning Authority and the designer.

5. Submit to Commissioning Authority, prior to Sequence Demonstration, two copies of installed control Drawings, sequence narratives, control wiring diagrams and program code or block diagrams.
6. Sequence Demonstration:

   a. After completing and documenting all required sequence tests with own staff, demonstrate sequence tests to the Commissioning Authority. Demonstration is to be performed by the BAS installer's programmer who programmed the control system for this specific project.
   b. If any of the demonstrated sequences fails to operate per the controls submittal, take corrective action and demonstrate the failed sequence tests to the Commissioning Authority a second time.
   c. If the Control Contractor fails to demonstrate proper sequence operation in any of the second round of sequence tests, the Commissioning Authority's costs for witnessing all further demonstration of that sequence may be assigned to the Control Contractor by the Owner as a deduct to their contracted price. The Control Contractor will not be responsible for costs related to failure due to design or to other factors beyond their control, though it is expected to call any design concerns (and other factors beyond their control that might cause failure) to the attention of the Commissioning Authority and the Owner's Representative.

7. Assist Commissioning Authority with programming of the energy management system for trend logs to support functional performance testing during field testing.

8. Assist Commissioning Authority with execution of the Commissioning Procedures. Commissioning Authority will present test schedule at Progress Meeting at least 1 week ahead of scheduled tests.
9. The Commissioning Authority, acting with Owner authority, may request the Control Contractor to assist with or perform minor loop tuning adjustments, set point and schedule changes, and other similar minor field corrections.
10. Recommended changes to the controls sequences, program code, and recommendations for additional points must go through the Owner's Representative and the designer. The designer is the final authority on all recommended sequence changes, and will submit such changes to the Owner's Representative for implementation.
11. Submit to Owner's Representative, at least two weeks prior to Final Completion, two copies of as-built version of points list, including I/O and virtual points, controls Drawings, program printout, and sequence narratives.
12. Participate in resolution of problems and deficiencies that are discovered during commissioning.

I. Duties of Balancer:

1. Attend commissioning portion of Project Meetings as necessary.
2. Participate in resolution of problems and deficiencies that are discovered during commissioning.
3. Assist Commissioning Authority with execution of commissioning procedures.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 COMMISSIONING PROCEDURES AT THE SITE

A. Testing Techniques:

1. Each testing procedure may use a variety of techniques. Generally it is preferred to observe new and existing equipment and systems during normal operation.
2. When functional and emergency modes of operation occur rarely or seasonally, if possible, simulate the conditions that trigger these operational modes.
3. Simulation of conditions may involve changing set points, changing schedules, simulating pneumatic system pressures or energy management system voltages and currents, disconnecting power, jumpering contacts, or other such procedures.
4. Whenever temporary adjustments are made, restore the system to its original condition once tests are completed.
5. When testing requires observing equipment operation over an extended period, use the building energy management system's trend logging capabilities or independent monitoring equipment.
6. Do not use the building automation system trend logging in the commissioning process prior to point-to-point checkout by Controls

Contractor and approval of point-to-point checkout by Commissioning Authority.

7. Measurement of room lighting levels during evening hours with only artificial lighting, during mid-morning, around noon and mid-afternoon with only natural lighting and with both natural and artificial lighting. Repeat same measurements following calibration of room daylighting sensor.

B. Commissioning Documentation:

1. The Contractors are required to perform startup and checkout of their systems (prefunctional testing) and document the results. The Commissioning Authority will provide electronic forms that may be used by the Contractors. The Contractors may use their own forms if they contain all the required information on the Commissioning Authority's forms, but prior approval must be obtained.

    a. Where numeric data is required, a narrative entry or simple check-off is not acceptable.
    b. Annotate trend logs and monitored data as necessary to clarify meaning, and attach to relevant test reports.
    c. Do not attach irrelevant data to test reports.

2. The Contractor sends the startup and checkout forms to the Commissioning Authority when they are complete and functional. The Contractor sends a "Certificate of Readiness" with the forms which will signal that functional testing can begin.
3. Starting with prefunctional testing, the Commissioning Authority will e-mail an "issues log" weekly to inform the design and construction team of issues that need resolution. The "issues log" will open and close items as they are discovered and resolved until all items are closed.
4. The Commissioning Authority will assemble all the information from the Commissioning Plan (test forms, trend logs, issues log, and basis of design) into a final Commissioning Report.

C. Coordination of Commissioning and Equipment Startup: Do not initiate functional performance testing for equipment or systems in advance of their startup and checkout by affected equipment or system installers and manufacturers' representatives.

D. Test Acceptance Criteria:

1. Acceptance Criteria are the test results that are required before the mode of performance or inspection item in question will be considered acceptable.
2. Any procedures in Specification Section 23 08 00, Commissioning of HVAC and Section 26 08 00, Commissioning of Electrical, that begin with "Verify that..." have an implied acceptance criterion that the sequence as stated is proven to occur and is documented with visual observation notes, measurements, trend logs, and/or monitored data.
3. Acceptance criteria for other functional modes and checklist items are as stated in each section of the Commissioning Plan.
4. Input will be sought when necessary from the Architect's Engineer to determine if test results indicate compliance with Design Intent.
5. The Commissioning Authority will recommend acceptance or rejection of Commissioned System Work based on test results.

E. Resolution of Deficiencies:

1. Adjust, repair, or replace defective equipment and systems to meet Commissioning Procedure Acceptance Criteria as directed by Owner's Representative.
2. Inform the Owner's Representative and Commissioning Authority of the date for completion of corrective activities.
3. If the date for completion of corrective work passes without resolution of deficiencies, Owner's Representative reserves the right to obtain supplementary services and equipment to correct the problem as indicated in General Conditions.

F. Rechecking and Retesting Charges:

1. In the event of a second failure of a specific commissioning procedure item or test, the responsible party may be assessed charges by Owner's Representative.
2. Charges will be based on each party's actual expenses, including normal hourly billing rates for preparation, testing, and travel time, and materials, equipment rental, and travel expenses as applicable.

G. Construction and Acceptance Milestones for Tasks Related to Commissioning:

1. Equipment, ductwork, and piping installation.
2. Equipment startup.
3. Pre-functional Checklists.
4. Substantial completion.
5. Point-to-point checkout and sequence testing of controls.
6. Test and balance.
7. Commissioning field testing.
8. Occupant move-in.
9. Final completion.
10. Seasonal testing.
11. Commissioning report submittal.
12. Systems Manual submittal.

END OF SECTION

SECTION 03 35 00

CONCRETE FINISHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Finish required on exposed cast-in-place concrete and shotcrete surfaces including patching or repair of defective areas as described in Section 03 35 01 Concrete Finishes.

B. Related Work Specified Elsewhere:

1. Finish for concrete work beyond the building lines: See Sidewalks and Driveways.
2. Curing of formed concrete and expansion joint fillers: See Concrete, Cast-In-Place.
3. Caulking and Sealants.
4. Painting.

1.02 PROTECTION: Protect exposed surfaces including flat work as required to prevent damage by impact or stains.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Curing Compounds: ASTM C 309-81, Type 1, clear resin type free of oil, wax, grease, or other substance which might prove deleterious to any material to be applied to concrete and shall be approved by Environmental Protection Agency for use in the State of California and at this Project Site. Curing compounds for exposed slabs shall be a multi-purpose curing-hardener-sealer type equivalent to Floorseal "Mirrorcrete Hardener", or Vaporseal 309 Curing/Sealing Membrane and shall meet the above requirements.

B. Sealer: Floorseal “Mirrorcrete Sealer”.

C. Weakened Plane Joint Former: Burke Co. "Zip Strip Plastic Joint Former", or approved equal, two-part, rigid PVC plastic, depth equal to 1/4 of slab thickness(min.).

PART 3 - EXECUTION

3.01 CURING

A. Curing Compound - General:

1. Follow directions and recommendations of compound manufacturer.
2. Application shall commence immediately following completion of specified finishing and/or following disappearance of surface "sheen".
3. When applying compound, the surfaces shall be damp but shall be free from standing water.
4. Surfaces shall be covered with a uniform and even film of compound, as supplied. Using pressurized spray equipment, lambswool applicator or short nap roller, apply in a single coat to achieve total coverage as recommended by manufacturer.
5. When curing compound is applied inside enclosed spaces, adequate mechanical ventilation shall be provided and maintained throughout the periods of application.

3.02 PATCHING AND REPAIR OF DEFECTIVE AREAS

A. Within 3 days after stripping formwork, surface defects such as rock pockets, honeycombs, cracks, and holes exceeding 3/16" diameter shall be filled and patched. The Architect shall distinguish between concrete which requires replacement or repair and surface defects which require patching. Permission to patch any area shall not be construed as a waiver of the Architect's right to require complete removal of the defective work if the patching, in his opinion, does not satisfactorily restore the quality and appearance of the surface.

B. Areas to be patched shall have loose material chipped away and shall be thoroughly dampened for at least 6 inches entirely surrounding the patch. Coat areas with thin brush coat of fine sand-cement grout followed by patching mortar. Patching mortar shall be prepared of the same material and proportions as used for concrete, except that coarse aggregate shall be removed. Where exposed formed concrete is to remain unpainted, trial patches using combinations of white cement and cement used in concrete mix shall be allowed to set up in order to verify that the patching mortar shall match the color of the adjacent concrete surface. Water in the mix shall be kept to a minimum. Mortar shall not be retempered by adding water. Mortar shall be allowed to stand for one hour prior to use and shall be mixed to prevent setting. Mortar shall be compacted thoroughly into place and screeded to leave patch slightly higher than surrounding surfaces and then left undisturbed for 1 to 2 hours to permit initial shrinkage. Patch shall then be finished to match adjacent surfaces.

C. Form tie holes shall be patched and finished flush with adjacent surface. For holes passing entirely through walls, a plunger type "grease gun" or other suitable device shall be used to completely fill holes.

3.03 FINISHING

A. Formed Surfaces: Remove fins and projections, patch, and leave "as formed". Air bubbles or "bug-holes" not exceeding 3/16" diameter need not be repaired.

B. Flatwork: Unless otherwise noted or specified, slabs shall be finished monolithically. Floor slabs which are indicated as sloped to floor drains shall be sloped uniformly so as to provide positive drainage of the indicated areas. Special care shall be taken that a smooth, even joint is obtained between successive pours.

C. Floor slabs that are indicated to be formed with camber specified on the drawings, shall have concrete placed to maintain the minimum thickness noted on the drawings throughout each pour. Set screed spins or other elevation devices to match camber requirements.

D. Slabs to receive concrete wall pours above shall have keys and or roughened surfaces per drawings and 033100-3.04B and C.

E. Tolerance: Comply with ACI 117 for local flatness/levelness tolerance measured in accordance with ASTM E1155. Specified Overall Value (SOV) of F/F=30 and Minimum Local Value (MLV) of F/F=25, all as per ACI 302 and with the following specific requirements:

1. Slabs-On-Grade Designated at Apparatus Bay, Carpet and to Receive Mortar Beds:
   a. Floor Flatness (F/F): SOV=25 MLV=25
   b. Floor Levelness (F/L): SOV=20 MLV=20

2. Slabs-On-Grade Designated to Receive Resilient Flooring, Ceramic Tile or Left exposed:
   a. Floor Flatness (F/F): SOV=35 MLV=25
   b. Floor Levelness (F/L): SOV=30 MLV=20

3. Concrete Fill on Metal Deck Designated to Receive Mortar Beds and Roofing:
   a. Floor Flatness (F/F): SOV=25 MLV=20

4. Elevation tolerance: 80 percent points taken within individual sets of readings shall fall within +3/8 inch to -3/8 inch from design elevation indicated on Drawings.

H. Trowel Finish (Typical for interior exposed areas): After the concrete slab has been float finished, the surface shall be troweled at least twice to a smooth, dense, uniform finish free of defects and blemishes. Jitterbugs shall not be used. No dry cement or mixture of dry cement and sand shall be sprinkled on the surface.

I. Treads of concrete stairs shall have a broom finish. Forms for risers shall be removed as soon as concrete has set and surfaces plastered with cement grout and troweled smooth. Treads without safety nosings shall have (4) evenly spaced grooves troweled in with grooving tool.

3.04 SEALER: At cleanup time for the entire Project, concrete slabs which will be exposed in the completed project, shall receive one (1) coat of the same curing-hardener-sealer compound used for original curing and specified herein under "Curing Materials". Follow manufacturer's directions and recommendations.

3.05 FLATNESS AND LEVELNESS TESTING: Concrete slabs on grade and concrete fill on metal deck shall be tested to verify that flatness and levelness of the completed work meets the specified tolerances in accordance with ACI and ASTM references noted above.

3.06 DEFECTIVE WORK: Finish which is not true to line and plane, which is not in conformance with specified finish and appearance requirements, which exceeds specified tolerances, which does not properly connect to adjoining work, which does not slope to drain and which has been improperly cured, will be deemed as defective. Defective work shall be repaired or removed and replaced as directed by the Architect with proper work meeting Drawing and Specification requirements and at no added cost to the Owner.

END OF SECTION

SECTION 03 45 40 - PRECAST CONCRETE SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following precast architectural concrete units: design/build assemblies:

1. ~~Precast concrete~~ W~~w~~all caps.
~~1.~~2. Window sills.
~~2.~~3. Inserts, ~~pedestals,~~ anchors, and other miscellaneous accessories required for ~~a~~ complete installation**s.**

B. Related requirements: All other concrete work.

1.2 SUBMITTALS

A. Shop drawings: 3/8-inch scale minimum of each typical ~~wall cap~~unit, showing layouts, and section ~~of each type of unit~~, reinforcement, inserts, connection details, and relationship to adjacent materials.

1. Show setting mark of each unit and its location on the structure. The precast units when delivered shall bear the same corresponding setting mark on a concealed surface.
2. Provide location and details of anchorage devices to be embedded in other construction. Furnish templates, if required, for accurate placement.

B. Samples after preliminary approval: Full size Samples of ~~wall caps~~each type of unit at job site, showing the full range of colors and textures proposed for the Work.

C. Calculations: Signed & stamped by a licensed California Professional Engineer.

1.3 QUALITY ASSURANCE

~~A. Delegated design requirements:~~

~~1. Design and engineer the precast concrete wall caps to safely support loads prescribed by Code, but not less than 100 psf, without damage to the units or their supports.~~
~~2. Limit deflection to L/360 or less where required to prevent damage to the units under load.~~

~~B.~~A. Manufacturer’s qualifications:

1. Firm listed or others with a minimum of 3 years continuous operation in production of precast concrete ~~specialties~~units, having experience, adequate facilities and capacity to provide the quality, sizes and quantity of precast units required, and whose products have been previously used and exposed to the weather with satisfactory results.
2. When requested, submit manufacturer's experience record to the Architect prior to award of this work.

~~C. Engineering:~~

~~1. The Contractor is responsible for the engineering, fabrication and installation of the precast units, including attachment to their supports.~~
~~2. Submit calculations, signed by a California-licensed structural or civil engineer, for the design of the units and their attachments to the supports. Attachments shall not require modifications of the supports indicated.~~

1.4 HANDLING

A. General:

1. Transport, store on non-staining plankings, and handle precast units to prevent staining and damage.
2. Do not place units on ground.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ACI 318; PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete"; PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products"; AWS D1.1/D.1.1M; and AWS D1.4.

~~2.1~~2.2 MANUFACTURERS

A. Architectural Facades, Gilroy CA
B. Dura Art Stone.
C. Stepstone, Inc., Los Angeles CA.
D. Mid State Concrete Products Inc., Santa Maria CA.
E. California Cast Stone., Atascadero, CA.
F. Universal Precast Concrete Inc, San Jose CA.., or equal, provided they comply with these Specifications.

~~2.2~~2.3 MATERIALS

A. Reinforcement:

1. Reinforcing Bars: ASTM A 615, Grade 60 (Grade 420), deformed.
2. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from galvanized-steel wire into flat sheets.
~~1. As selected by the Contractor.~~
~~2. Identify type and size of reinforcement on Shop Drawings.~~
3. ~~Galvanize bars larger than 5/8 inch where concrete cover is 2 inch and less, and bars 5/8 inch where cover is 1-1/2 inch or less.~~ The concrete cover in all cases shall be at least twice the diameter of the bars.

B. Supports for reinforcement: As selected by the fabricator, but must be plastic, galvanized or stainless steel.
C. Portland cement: ASTM C 150, Type I or II, white cement if required to match approved Samples. Use only one brand and type of cement, same as in approved Samples.
D. Aggregates: ASTM C 33 to match approved Samples, except that gradation may vary to achieve the required finish and texture. Do not use stone dust.
E. Coloring pigments:

1. Inorganic (natural or synthetic) iron oxide pigments meeting ASTM C 979 excluding the use of a cement grade of carbon black pigment, guaranteed by the pigment manufacturer to be lime-proof and color-fast.
2. The amount of pigment shall not exceed 10 percent by weight of the cement used.

F. Water: Potable, fresh.
G. Admixtures: Selected by the manufacturer, subject to the Architect's approval.

2.4 ACCESSORIES AND FINISHES

~~H.~~A. Form materials: Watertight, plastic, wood, or other acceptable materials that are non-reactive with concrete and will produce the required finish surfaces.
B. Steel shapes and plates: ASTM A 36.
C. Bearing pads: High density plastic bearing pad strips.
D. ASTM C 1107, non-metallic, non-shrink, color to match precast units.
~~I.~~E. Zinc-rich coating: Same as 05 50 00.

~~2.3 PRECAST UNITS~~

~~2.4~~2.5 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes to obtain cured material with the following properties:

1. Twenty-eight-day compressive strength of 5~~4~~,000 psi hardrock, using type III cement minimum.
2. To match approved Samples when finished, cured and aged.
3. Adequate workability and proper consistency to permit mix to be worked readily into the forms, and around reinforcement without segregation and excessive bleeding, and to be finished to match approved Samples.

B. The average water absorption of precast units shall not exceed 6 percent by dry weight when tested in accordance with the requirements of these Specifications.
C. Reinforce precast units as required for handling, and to allow for temperature changes and structural stress.

~~2.5~~2.6 FABRICATION

A. Concrete mixing: Comply with ASTM C 94.
~~A.~~B. Place concrete in each form in a continuous operation to prevent the formation of seams.
~~B.~~C. Thoroughly consolidate placed concrete by internal and external vibration without dislocation or damage to reinforcement.
~~C.~~D. Tolerances:

1. Height and width: Plus 1/16-inch to minus 1/8-inch.
2. Length: Plus 1/8-inch.

~~D.~~E. Cure units to obtain concrete of the compressive strength specified and to prevent shrinkage cracks. Comply with ACI 304.
~~E.~~F. Finish:

1. Surfaces to be concealed in the Work: As cast finish.
2. Exposed surface: Fine grained texture ~~wall caps~~units matching approved Samples.

~~F.~~G. Testing:

1. Perform in accordance with ASTM C 31, C 39 and C 642.
2. Determine test results by the average of 3 specimens per test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine bearing surfaces, inserts and adjacent construction for conditions that may affect the proper and timely execution of this work.
B. Correct detrimental conditions before proceeding with installation.

3.2 INSTALLATION

A. Handle units so as not to cause damage, distortion or undue stresses.
B. Place, and secure units in accordance with the approved Shop Drawings. Set units straight, level, plumb, and square. Do not install damaged units, except with the Architect's approval in each case.
C. Wet the units thoroughly and set on a full bed of mortar, colored to match units, using plastic spacers to maintain uniform joint width until mortar cures.

1. After each unit is set, rake joints to a depth of 3/4-inch from the face for pointing.
2. Then sponge face of each unit to remove splashed mortar or mortar smears.

D. Anchor units securely to supports by embedding in structural epoxy adhesive on pre-set stainless steel dowels, or by drilling concrete slabs and precast units and setting dowels in structural epoxy adhesive.

3.3 POINTING AND CALKING

A. Before pointing, scrub the face of precast units with a fibre brush, using soap powder and water. The rinse thoroughly with clean water. Remove mortar on the face of the precast units.
B. Point joints using colored grout matching color of precast concrete, as approved by the Architect.

3.4 CLEANING/PROTECTING

A. Clean ~~cast~~ precast units, after grout has cured, using clean water and stiff-bristle brushes. Do not use wire brushes, cleaning agents that would cause staining, or other cleaning compounds with caustic or harsh fillers.
B. Protect precast units against damage and stain until Substantial Completion.

1. Do not pour concrete and do not plaster adjacent to unprotected precast units unless the units are protected by waterproof coverings secured against displacement; do not allow wash from concrete and plaster to run onto precast units.
2. Cover precast units subject to physical damage with solid materials that will not stain the units.

C. Repair of damaged units will be permitted only when the results are acceptable to the Architect; otherwise remove and replace pieces that are broken, chipped, stained or otherwise damaged.

1. Provide new matching units, install as specified and point-up joints to eliminate evidence of replacement.
2. Repoint defective and unsatisfactory joints to match adjacent joints.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes metal fabrications not classified as "structural steel", and not specified in other Sections including a raised rooftop metal roof mounting grid for attaching antenna's and other devices to the assembly.

B. Related requirements:

1. Division 03 for grouting and dry-packing other than required for the work of this Section.
2. Division 05 for aluminum ladder with cage.
3. Divisions 05 and 09 for lightgage metal framing (studs, channels, etc.) for support of plaster and gypsum board, and backing plates for surface-applied items fastened to these materials.
4. Division 09 for finish painting metal fabrications.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Scheduling and sequencing: Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not comply with structural performance requirements.

1.3 SUBMITTALS

A. Data:

1. Specifications and installation instructions for manufactured items.
2. Manufacturer's literature, including engineering data for anchors.

B. Shop Drawings:

1. Large scale, dimensioned Shop Drawings of metal fabrications indicating in detail methods of fabrication and assembly, weight, materials, holes, lugs, inserts, finishes and other pertinent data.
2. For components to be embedded in concrete and masonry work, furnish templates supplemented by dimensioned Shop Drawings to trades placing those components in their work. Assist in location of these components where so requested by those trades.

C. Samples: The following Samples, at least 6 inches long.

1. Welded connection between the following components showing proposed weld quality and finish.
    a. Pipe to pipe (railing).
    b. Pipe to bar.
    c. Tube to tube.
    d. Tube and bar.

D. Delegated design submittals: Drawings and engineering calculations:

1. Calculations signed and sealed by a California-licensed professional engineer, to demonstrate Code compliance for Contractor engineered assemblies, including railings and other load-bearing assemblies.
2. Calculations shall be legible and shall incorporate sufficient cross references to Shop Drawings to make calculations readily understandable and reviewable. Test reports are an acceptable substitute for calculations for the anchors only. Calculations shall include, but are not limited to, analysis of anchors, including anchors embedded in concrete.
3. Drawings and calculations shall bear Calculations shall bear the seal and signature of the design engineer.

1.4 QUALITY ASSURANCE

A. Engineering responsibilities: Delegated design.

1. Certain metal assemblies are not fully detailed on the Drawings, which indicate desired profile and design intent; they have not been engineered.
2. Contractor is responsible for their engineering, fabrication and installation to withstand loads and other criteria prescribed by Code, indicated, or specified, within the physical limitations indicated on the Drawings.
3. A California-licensed professional engineer employed by the Contractor shall prepare drawings and calculations for the assemblies. Fasteners and connections where indicated are shown schematically.
    a. Fasteners or connections shall not conflict with or require revision of the finish profiles of the ladders or the supporting work.
    b. Connections to the primary supports shall not impose eccentric loading, or induce twisting or warping.
    c. Connections to the primary supports shall be able to accommodate misalignment of the steel structure within limits allowed by the AISC tolerances.

B. Qualifications for welding work:

1. Qualify welding procedures and welding operators in compliance with AWS "Qualification" requirements of AWS D1.1.
2. Examine that welders to be employed in this work have satisfactorily passed AWS qualification tests.
3. If recertification of welders is required, retesting shall be Contractor's responsibility.
4. Submit certificates of compliance to demonstrate compliance with the above requirement.
5. Costs for fabricator tests, inspections and quality control shall be borne by the Contractor.

C. Special inspections:

1. Except where otherwise specified, special inspections by Owner’s testing laboratory, prescribed by Code, will not be required where work is performed on the premises of a licensed fabricator, registered and approved by authorities having jurisdiction to perform such work without special inspection.
2. Submit certificates of compliance to demonstrate compliance with the above requirement.
3. Costs for fabricator tests, inspections and quality control shall be borne by Contractor.

1.5 HANDLING

A. Store metal fabrications above ground, under cover.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Provide load-bearing assemblies capable of safely withstanding dead loads of the assemblies, plus live loads prescribed by Code without exceeding allowable design working stress of materials involved, including anchors and connections. Apply each load to produce maximum stress in each component.

B. Thermal movements: Provide exterior assemblies with expansion joints spaced so that no distortion or damage occurs when subjected to a surface temperature of plus 180 degrees and a temperature swing of 160 degrees (plus 20 to plus 180 degrees).

1. Make joints as small as possible but sufficiently wide to meet the design criteria.
2. Show joint spacing on Shop Drawings.
3. Space joints equally and symmetrically. Joint locations are subject to relocation at no additional cost to the Owner.

C. Deflection: Limit deflection under uniform load to L/360; L/120 under concentrated load; or 1/4-inch maximum, whichever is more restrictive.

2.2 MATERIALS

A. Metal surfaces - general: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and absence of surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel plates, shapes, and bars: ASTM A 36.

C. Steel tubing:

1. Cold-formed steel tubing: ASTM A 500, Grade A or B, as required for design loading, unless otherwise indicated.
2. Hot-formed steel tubing: ASTM A 501. For exterior installations and where otherwise specified, provide tubing with hot-dip galvanized coating in compliance with ASTM A 53.

D. Steel pipe/tubing:

1. Handrails: One of the following.

   a. Welded and Drawn Over Mandrel (DOM), ASTM A 513, Type S.
   b. Cold Drawn Seamless (CDS), ASTM A 519.
   c. Hot Finished Seamless (HFS), ASTM A 519, machined to match the finish of the DOM steel above.

2. Elsewhere: ASTM A 53; finish, type, and weight class as follows.

   a. Galvanized finish for exterior installations and where specified, black finish elsewhere.
   b. Type S, Grade A, standard weight (schedule 40), unless another grade or weight or both required by design loading.

E. Uncoated structural steel sheet: Product type (manufacturing method), quality, and grade, as follows.

1. Cold-rolled structural steel sheet: ASTM A 1008, Grade A, unless otherwise required by design loading.
2. Hot-rolled structural steel sheet: ASTM A 1011, Grade 30, unless otherwise required by design loading.

F. Uncoated steel sheet: Commercial quality, product type (method of manufacture) as follows.

1. Cold-rolled steel sheet: ASTM A 1008.
2. Rolled steel floor plate (Checkered): ASTM A 786, Pattern No. 1, 4 or 5. Use same pattern throughout the Project.
3. Hot-rolled steel sheet: ASTM A 1011.

G. Galvanized steel sheet:

1. Structural quality: ASTM A 653 SQ, Grade 33, G90 designation, unless another grade required for design loading.
2. Commercial quality: ASTM A 653 CQ, G90 coating designation.

H. Concrete inserts:

1. Threaded or wedge type galvanized ferrous castings, either malleable iron complying with ASTM A 47, or cast steel complying with ASTM A 27.
2. Provide bolts, washers, and shims as required, hot-dip galvanized in compliance with ASTM A 153.

I. Welding rods and bare electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

J. Fasteners: Provide zinc-coated fasteners for exterior use or where built into exterior walls, elsewhere fasteners may be uncoated. Select fasteners for type, grade, and class required.

1. Bolts and nuts: Regular hexagon-head bolts, ASTM A 307, Grade A, Property Class 4.6; with hex nuts, ASTM A 563; and flat washers, unless otherwise indicated.
2. Anchor bolts: ASTM F 1554, Grade 36.
3. Machine screws: ASME B18.6.3, ASME B18.6.7M.
4. Plain washers: Round, carbon steel, ASME B18.22.1.
5. Lock washers: Helical, spring type, carbon steel, ASME B18.21.1.
6. Drilled-in expansion anchors:
    a. Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, [non-drilling]), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade S, by Hilti, Inc., or ITW Ramset/Red Head.
    b. Select anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E 488.
7. Chemical anchors:
    a. Set by Simpson Strong-Tie Co., Inc., or HY-150 by Hilti, both used with machine bolts complying with FS FF-B-575, Grade S.
    b. Select drilled-in and chemical anchors to resist loads imposed thereon with a safety factor of 4 minimum for static loads, and 10 minimum for dynamic and overhead loads.
8. Lock washers: Helical spring type carbon steel, FS FF-W-84.

K. Grout: Pre-packaged, non-shrink, non-metallic grout, non-staining, nongaseous grout complying with ASTM C 1107.
L. Cement (expansive): Factory-prepared with accelerators quick-setting hydraulic cement complying with ASTM C 595.
M. Shop primer for ferrous metal:

1. Interior surfaces: Tnemec “10-99,” or “Unibond” (basis of design), or equal fast-curing, lead-free, universal modified alkyd primer selected for compatibility with finish paint systems specified in Section 09 90 00, and complying with performance requirements equal to or better than the basis of design.
2. Exterior surfaces: As specified in Section 09 96 00.

N. Galvanizing repair (zinc-rich) paint: “94-H20 Hydro-Zinc” by Tnemec Co., or equal.
O. Bituminous paint: Cold-applied asphalt mastic complying with SSPC Paint 12 but containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 PREFABRICATED UNITS

A. Safety Post: Where ladder terminates at roof hatch, provide Bilco "LadderUp" safety post or "Hatch Access Safety Rail" by Precision Stair Corp., “Extend-A-Rail” by Precision Ladders, Ltd., or equal, complete with hardware and fasteners required for installation.
B. Steel pit ladder: Configuration as indicated by MAXM Metal Products, or equal.
C. Roof mounting grid: “DryStand” Support by RoofScreen, configuration as indicated, or equal, consisting of the following:

1. Round post supports:12-gage galvanized steel tubing, ASTM A 500, welded to minimum 1/4-inch steel base plate, ASTM A 36.
2. Sleeve tube: 11-gage galvanized tubing.
3. Round post cap: AISI Type 304 stainless steel with mill finish.
4. C-saddles, T-saddles and C-channels: Formed G90 galvanized cold-rolled steel, ASTM A 653.

D. Unistrut framing:

1. Multipurpose steel profiles by Unistrut, Power-Strut, Famet, or equal, complete with manufacturer's standard steel fasteners and connectors, nuts integrally self-locking or fitted with locking devices. Provide galvanized steel members where embedded in concrete or masonry, and factory-primed items elsewhere.
2. Provide hanger rods, nuts, bolts, connectors, and anchors with electro-galvanized finish.

2.4 FABRICATION - GENERAL

A. Comply with the reference standards and the following.
B. Engineer, fabricate and install exterior components to allow for expansion and contraction for a temperature range of 150-degree F without causing buckling, excessive opening of joints, and over-stressing of welds and fasteners.
C. Drill holes for bolts and screws. For screws exposed to view in finished surfaces use FHCS type with screw slots filled and finished flush and smooth with adjacent surfaces.
D. Form exposed work true to line and level with accurate angles and surfaces, and straight, sharp edges, so assembling can be done without filler pieces.
E. Shear and punch metals cleanly and accurately. Remove burrs.
F. Remove sharp or rough areas on exposed surfaces. Projecting edges are not permitted. Ease exposed edges to a radius of approximately 1/32-inch.

G. Weld corners and seams continuously to comply with AWS recommendations and the following:

1. Do not use stitch, spot or tack welds on exposed surfaces.
2. For work exposed to view, provide weld quality and finish equal to NOMMA Finish #1. Elsewhere provide weld quality and finish equal to NOMMA Finish #4.
3. Use materials, methods and welding sequence that minimize distortion and develop strength and corrosion resistance of base metals.
4. Obtain fusion without undercut or overlap.
5. Remove welding flux immediately.
6. At exposed connections, undercut edges of components to be welded, weld and finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
7. Where welds will be exposed to the elements, weld connections between various pieces continuously to prevent water intrusion in the weld area, or seal welded parts, after weld is ground, with silicone sealant specified in Section 07 92 00.

H. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the strength of the material.

I. Form exposed connections with flush, hairline joints, using concealed fasteners wherever possible. Cope intersections of rails and posts, weld joints, and grind smooth; butt weld end-to-end joints of railings or use welding connectors.

J. Bend pipe without collapsing or deforming its walls, to produce a smooth, uniform curved section and to maintain uniform sectional shape.

K. Fabricate joints that will be exposed to the weather with weep holes where water or condensation may accumulate.

L. Fabricate items to be galvanized in accordance with ASTM A 385. Limit use of vent and drain holes and locate where concealed from view in the finish work.

M. Cut, reinforce, drill, punch, thread and tap metal work as required to receive finish hardware and similar items of work.

N. Fabricate items in the largest Sections practical to minimize field jointing.

O. Provide supplementary parts necessary to complete each item of metal fabrication even though such parts may not be shown or specified. Provide all anchors, brackets, and sleeves for securing metal work to adjacent construction.

P. Remove blemishes by grinding before cleaning, treating, and applying specified finishes.

2.5 PIPE RAILING FABRICATION

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Connect members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose when acceptable to the Architect. Weld connections continuously to match approved Samples.

E. Brackets, flanges, fittings, and anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other work, unless otherwise indicated.

1. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
2. For railing posts set in concrete, unless otherwise indicated, provide preset sleeves of steel not less than 6-inch long with inside dimensions not less than 1/2-inch greater than outside dimensions of post, and steel plate forming bottom closure.

F. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
G. Fabricate joints to be exposed to weather to be watertight.
H. Close exposed ends of handrail and railing members.
I. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4-inch or less.
J. Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.6 WELDING

A. Weld shop and field connections continuously in compliance with AWS D1.1, Structural Welding Code - Steel, and AWS D1.3, Structural Welding Code - Sheet Steel, unless bolted connections are specifically shown.
B. Grind welds that will remain exposed, smooth and flush to match and blend with parent metal surfaces. Match approved weld Samples.

2.7 FABRICATION TOLERANCES

A. Squareness: 1/8-inch maximum difference in diagonal measurements.
B. Maximum offset between components at joints: 1/16-inch except that at welded joints no offset is allowed.
C. Maximum misalignment of adjacent members: 1/16-inch.
D. Maximum bow: 1/8-inch in 48-inches.
E. Maximum deviation from plane: 1/16-inch in 48-inches.

2.8 GALVANIZING

A. Follow procedures outlined in ASTM A 143 to safeguard against and test for possible embrittlement.
B. Unless fabricated from galvanized materials, after fabrication hot-dip galvanize exterior ferrous metal items and items installed in exterior walls, which will be concealed when the work is completed and which are totally or partially exposed to the weather, in compliance with ASTM A 123 or A 153, as applicable
C. Excessive dross, rough surfaces, blisters, lumpiness, runs, edge tears, spikes, and chromate quenching are unacceptable.
D. Safeguard assemblies against steel embrittlement in compliance with ASTM A 143, and against distortion in compliance with ASTM A 384.
E. Coating weight shall conform to Table 1 of ASTM A 123, or ASTM A 153, as applicable.
F. Plug vent holes with lead or silicone sealant after galvanizing.
G. If necessary to prevent humid storage staining, quench freshly galvanized steel in a passivating solution.

2.9 SHOP PRIMING

A. General – treatment and locations:

1. Surfaces exposed in the Work which fit the definition in Paragraph 2.8, B, above: SSPC SP6 followed by application of zinc-rich primer.
2. Surfaces concealed from view:

a. Exterior: Steel cleaning and preparation followed by hot-dip galvanizing all in accordance with the American Galvanizers Association's recommendations and Article 2,5 of Section 09 96 00 in the Specifications.
b. Interior: SSPC SP3 followed by rust inhibitive shop primer.

B. Apply a heavy coat of bituminous paint to metal surfaces that will be in contact with cementitious materials. Do not apply on exposed surfaces.
C. Shop prime metal assemblies as follows, unless otherwise specified in Section 09 96 00:

1. Prepare surfaces as specified above.
2. Remove loose mill scale, rust, cutting and punching burrs, oil, grease and other deleterious materials before priming.
3. Immediately after surface preparation, apply primer in compliance with its manufacturer's instructions to provide a uniform dry film thickness of not less than 1-1/2 mils per coat for rust-inhibitive primer and 3.5 to 3.5 mils for zinc-rich primer. Use painting methods that will result in full coverage of joints, corners, edges and all exposed surfaces.
4. Apply primer to completely cover all exposed surfaces as well as surfaces concealed after assembly. Stripe paint corners, crevices, bolts, welds, and sharp edges.
5. Allow paint to dry thoroughly before handling.
6. Apply one coat of primer to surfaces exposed in the finished work, and 2 coats to surfaces that will be inaccessible after their assembly or erection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.
B. Correct detrimental conditions before proceeding with installation.

3.2 INSTALLATION

A. Corrosion prevention: Prevent galvanic action and other forms of corrosion by isolating metals and other materials from direct contact with incompatible materials using heavy bituminous paint at least 10 DFT, hard plastic spacers, Teflon tape, or silicone or neoprene gaskets.
B. Fastening:

1. Provide anchorage devices and fasteners required for attaching metal fabrications to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors required.
2. Fasten the roof mounting grid to structural members in the roof with fasteners appropriate for the type of structure indicated.
3. Dry-pack metal fabrications supported on concrete and masonry as specified in Section 03 30 00 to provide firm, level bearing surfaces.

C. Cutting, fitting and placing:

1. Perform all cutting, drilling and fitting required for installation of metal fabrications.

2. Set items accurately in their proper location, alignment and elevation, plumb, level, true and free of rack as measured from established lines and levels.
3. Provide temporary bracing or anchors for items to be built into concrete, masonry or similar construction.
4. Fit exposed connections accurately to form flush, hairline joints.
5. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and flush with parent metal.

D. Field welding: Comply with AWS Code for procedures of manual shielded arc welding, appearance and quality of welds made, and methods used to correct faulty welds.

E. Prefabricated units: Install as specified, and in compliance with their manufacturer's instructions.

F. Safety post:

1. Attach to the ladder side rails in accordance with the post manufacturer’s instructions.
2. Verify that post locks securely in “up” position.
3. Adjust and lubricate for smooth operation.

G. Ladder installation:

1. Install with surfaces and edges plumb, level and in alignment with adjoining work.
2. Install top of the top rung level with top of access level or landing platform served by ladder.
3. Attach securely to supports.

H. Installation tolerances: Adjust metal fabrications for squareness, alignment, twist, levelness and plumbness to the following tolerances.

1. Squareness where applicable: Plus or minus 1/16-inch, measured on the diagonal.
2. Alignment: Plus or minus 1/16-inch where fabrications are separated by one inch or more; where components join or are separated by less than one inch, components shall be aligned; no deviations permitted.
3. Twist: Plus or minus 1/16-inch, except that deviation shall be such that joined panelized components are flush at joints; no deviations permitted.
4. Plumbness: Plus or minus 1/16-inch, except that deviation shall be such that joined panelized components are flush at joints; no deviations permitted.
5. Levelness: 1/8-inch from level, except where tighter tolerances are required for joining or alignment with adjacent work.
6. Deviation from theoretical location in plan: 1/4-inch, except where tighter tolerances are required for joining or alignment with adjacent work.

3.3 FIELD QUALITY CONTROL

A. Extent and Testing Methodology: Owner’s Testing agency may randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Railings will be tested according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.

1. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and will comply with specified requirements.
2. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

B. Touchup:

1. General: Immediately after erection, clean field welds, bolted connections and abraded areas, and proceed as follows.
2. Damaged primer: Clean the damaged area, sand smooth, re-clean and spot-prime with the same paint as that used for shop priming applied to the same dry film thickness as the undamaged primer; minimum thickness of 2 dry mils.
3. Damaged zinc coating:
    a. Clean abraded area in accordance with SSPC-SP11, “Power Tool Cleaning” to bare metal all welds and damaged zinc coating. Extend cleaning 2 inches past damaged area.
    b. Spot prime damaged area with Tnemec “94-H20 Hydro-Zinc” applied at 2.5 to 3.5 Mils DFT.
4. Where galvanized surface will remain exposed in the Work, repair damaged areas with zinc-based solder in accordance with ASTM A 780, regardless of the width of the abrasion (not limited to 3/16-inch).

END OF SECTION

SECTION 07 12 40 – FLUID-APPLIED COMPOSITE WATERPROOFING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Cold fluid-applied waterproofing system.
2. Composite membrane.
3. Prefabricated drainage composite.
4. Protection board.
5. Insulation.

B. Related requirements: Division 07 for joint sealants.

1.2 SYSTEM DESCRIPTION

A. Fluid Applied Membrane: Two-component self-curing synthetic rubber waterproofing membrane.
B. Composite Membrane: 3-layer reinforced composite membrane fully embedded into fluid-applied membrane with end laps and sidelaps taped with self-adhering waterproofing membrane.
C. Accessories and Materials for complete waterproofing application.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Performance requirements: Provide a waterproofing system that prevents the passage of liquid water under hydrostatic pressure and complies with physical requirements as demonstrated by testing performed by an independent testing agency of manufacturer's current waterproofing formulations and system design.
B. Pre-installation conference: A pre-installation conference shall be held prior to application of the waterproofing system to assure proper substrate and installation conditions, to include Contractor, waterproofing installer, Architect and special inspector (if any).

1.4 SUBMITTALS

A. Data: Manufacturer Product Data for the waterproofing system specified, including manufacturer's instructions for evaluating, preparing, and treating the substrate, technical data, and tested physical and performance properties.
B. Shop drawings: Show locations and extent of waterproofing, including details for substrate (drainage mat) installation and preparation, including sheet flashing, penetrations, and other termination conditions.
C. Samples:

1. Fluid applied membrane.
2. Composite Membrane.
3. Protection board.
4. Prefabricated drainage composite.
5. Insulation board.

D. Waterproofing manufacturer's ample warranty.
E. Installer certificates: Certificates signed by manufacturer certifying that Installers comply with requirements under the "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

A. Manufacturer: Firm with a minimum of 20 years' experience in the production and sales of waterproofing. The fluid applied composite sheet membrane waterproofing system shall be supplied by single manufacturer. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
B. Installer: Installer shall demonstrate qualifications to perform the work of this Section by submitting the following:

1. Certification or written license from the Waterproofing Manufacturer that the Installer is a trained applicator.
2. List of at least 3 projects contracted within the past 5 years of similar scope and complexity to this project.
3. Show evidence of adequate equipment and trained field personnel to successfully complete the project in a timely manner.
4. Installer's credentials must be approved by both the Architect and the Waterproofing Materials Manufacturer.

C. Inspection and Testing: All areas shall be water tested following application and be inspected an individual trained and approved by the waterproofing systems manufacturer.

1.6 HANDLING

A. Deliver materials to Project site as specified by manufacturer labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, and directions for storing and mixing with other components.
B. Store materials as specified by the waterproofing manufacturer in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.
C. Remove and replace material that cannot be applied within its stated shelf life.

1.7 PROJECT CONDITIONS

A. Protect adjacent areas not to be waterproofed. Where necessary, apply masking to prevent staining of surfaces to remain exposed wherever membrane abuts to other finish surfaces.
B. Perform work only when existing and forecast weather conditions are within manufacturer's recommendations for the material and application method used.
C. Minimum clearance of 24 inches is required for application of product. For areas with less than 24-inch clearance.
D. Ambient temperature shall be within manufacturer's specifications (greater than +19ºF)
E. Plumbing, electrical, mechanical and structural items to be under or passing through the waterproof membrane shall be positively secured in their proper positions and appropriately protected prior to membrane application.
F. Waterproof membrane shall be installed before placement of reinforcing steel. When not possible, all exposed reinforcing steel shall be masked by General Contractor prior to membrane application.

G. Remove sharp and irregular protrusions from shoring walls.
H. Horizontal Application - Concrete Deck Surface condition:

1. A minimum slope to drain of 1/8 in./ft shall be used on all concrete decks. This is best achieved with a monolithic structural slab and not with a separate concrete fill layer.
2. Ensure no excessive deflection or movement of the deck or other structural problems.
3. The deck shall provide for support of the maximum anticipated dead and environmental loads and for expansion and contraction suitable for the structure.
4. All projections, penetrations and openings in the deck shall be completed before the waterproofing application begins.
5. Joints in pre-cast/pre-stressed concrete decks shall be grouted so that the top surface is level and smooth before membrane application.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner 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. Special Warranty: Submit a written warranty signed by waterproofing manufacturer and Installer agreeing to repair or replace waterproofing that does not meet requirements or that does not remain watertight within the specified warranty period.

1. Warranty Period: 10 years after Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Grace Construction Products.
B. Or equal.

2.2 WATERPROOFING MATERIALS

A. Fluid Applied Waterproofing Membranes: Procor® 75 fluid applied membrane, a two part, self-curing, synthetic rubber based material. Procor® fluid applied membranes meet or exceed the performance requirements of ASTM C 836 and other ASTM standards as shown in the following table.

PROPERTY	TEST METHOD	TYPICAL VALUE
Color		Terra Cotta
Minimum Cured Film Thickness	ASTM D 3767 Method A	120 mils)
Solids Content	ASTM D 1644	100%
Flexibility, 180° bend over 25 mm (1 in.) mandrel at 32°C (-25°F)	ASTM D 1970	Unaffected
Elongation	ASTM D 412	500% minimum
Peel Adhesion to Concrete	ASTM D 903 Modified1	880 5 lbs/in.

Low temperature flexibility and crack bridging - 3.2mm (1/8 in.) cracked cycled at -26°C (-15°F)	ASTM C 836	Pass
Extensibility over 6.4 mm (1/4 in.) crack after heat aging	ASTM C 836	Pass
Puncture Resistance	ASTM D 4833	38 lbs

Footnote:
1.Procor waterproofing membrane is applied to concrete and allowed to cure. Peel adhesion of the membrane is measured at a rate of 50 mm (2 in.) per minute with a peel angle of 90° at room temperature.

2.3 COMPOSITE SHEET MEMBRANE

A. Procor Composite Membrane, a 16-mil, cross-laminated, high-density polyethylene membrane with the following properties:

Property	Test Method	Typical Value
Color		Terra Cotta
Thickness		36 mils
Puncture Resistance	ASTM D 1709	3912 grams
Tensile Strength	ASTM D 882	136 lbs/in
Vapor Transmission	ASTM E 96	0.030

B. Prefabricated Drainage Composite:

1. Hydroduct® 660 Drainage Composite for horizontal surfaces.
2. Hydroduct 220 Drainage Composite by Grace Construction Products for all vertical surfaces.
3. Drainage composite shall be designed to promote positive drainage while serving as a protection course.

C. Concrete Sealer: Procor Concrete Sealer for concrete surfaces likely to produce outgassing during drying process.
D. Composite Sheet Lap Sealing: Bituthene Low Temperature Membrane, a 60 mil self-adhering waterproofing comprising 56 mils of rubberized asphalt integrally bonded to a 4 mil high density cross-laminated polyethylene film.
E. Waterstop: Type for non-moving concrete construction joints.
F. Insulation: An extruded polystyrene rigid board insulation meeting the following requirements:

1. Minimum compressive strength, ASTM D1621, 40 or 60 psi.
2. Maximum water absorption by volume, ASTM C272, 0.1%.
3. Insulation shall have an R-value of 5.0 F.ft2.h/Btu/in. (0.88 K.m2/W) of thickness when tested at 75°F mean temperature in accordance with ASTM C518.
4. Product shall be free of CFCs.

G. Protection Board (only if prefabricated drainage composite is not used):

1. Asphalt Hardboard: A premolded semi-rigid protection board consisting of bitumen, mineral core and reinforcement. Provide 3 mm (0.125 in.) thick hardboard on

horizontal surfaces not receiving steel reinforced slab. Where steel reinforcing bars are to be used, apply two layers of 0.125 in. thick hardboard or one layer of 0.25 in. thick hardboard.

2. Expanded Polystyrene Protection Board: One inch thick for vertical applications with the following characteristics:

    a. Normal Density: 1.0 lb/ft^3.
    b. Thermal Conductivity, K factor: 0.24 at 40°F, 0.26 at 75°F.
    c. Thermal Resistance, R-Value: 4 per one inch of thickness.

H. Miscellaneous Materials: Tape and other accessories specified or acceptable to manufacturer of fluid applied waterproofing membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine soil substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with requirements.
B. Correct unsatisfactory conditions before proceeding with installation.

3.2 SUBSTRATE PREPARATION

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid applied waterproofing.
B. Tie-holes and "bugholes" larger than 1/2 inch in diameter or deeper than 1/8 inch, or both, shall be either pretreated with Procor or repaired with a lean concrete mix or with a lean concrete mix or grout. See ASTM D 5295, Preparation of Concrete Surfaces for Adhered Membrane Waterproofing Systems, for further details on substrate preparation.
C. Cracked, pitted, honeycombed or heavily bugholed surfaces can be filled by spraying from close in (10 to 12 inches) but high material usage with result. Under these circumstances it may be more efficient to fill the surface with a parge coat of lean mortar mix before application of the Procor. It is also acceptable to fill in gaps with a compatible sealant or caulk.
D. Cast-In-Place Concrete Substrates:

    1. For horizontal applications, poured in-place concrete must be cast with a minimum slope to drain of 1/8 in./ft. and must be monolithic, smooth, and free of unapproved curing compounds, form release agents and other surface contaminants.
    2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
    3. Repair bugholes over 0.5 in. in length and 0.25 in. deep and finish flush with surrounding surface.
    4. Remove scaling to sound, unaffected concrete and repair exposed area.
    5. Grind irregular construction joints to suitable flush surface.

E. Pre-cast Concrete Decks: All pre-cast units shall be mechanically fixed to minimize the potential for differential movement and all joints shall be grouted.

F. Masonry Substrates: Apply waterproofing over concrete block and brick with smooth trowel-cut mortar joints or parge coat.
G. Substrate Cleaning:

1. Thoroughly sweep the substrate that is to receive the waterproofing membrane.
2. Substrate must also be blown using oil free air to remove any remaining loose debris.
3. Perform final check to determine if the substrate is sufficiently clean is to apply a test patch of membrane and check its adhesion.

3.3 INSTALLATION

A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:

1. Vertical Application Fluid Applied Membrane:

a. Detailing: Apply a minimum thickness of 60 mils over all detail areas (including inside corners, outside corners, pipe penetrations, cracks, construction joints, etc) prior to application of the field of the membrane.
b. Apply a minimum thickness of 60 mils over all vertical areas to be waterproofed and lapping a minimum of 4 inches onto pre-treated detail areas. Perform wet film thickness tests as work progresses to confirm thickness.

2. Vertical Application Fluid Applied Membrane:

a. Detailing: Apply a minimum thickness of 60 mils over all detail areas (including inside corners, outside corners, pipe penetrations, cracks, construction joints, etc) prior to application of the field of the membrane.
b. Apply a minimum thickness of 90 mils over all vertical areas to be waterproofed and lapping a minimum of 4 inches onto pre-treated detail areas. Perform wet film thickness tests as work progresses to confirm thickness.

3. Horizontal Application Fluid Applied Membrane:

a. Detailing: Apply a minimum thickness of 60 mils, or as per manufacturer's drawings and written application instructions, over all detail areas (including inside corners, outside corners, pipe penetrations, cracks, construction joints, etc) prior to application of the field of the membrane
b. Apply a minimum thickness of 60 mils over all horizontal areas to be waterproofed and lapping a minimum of 4 inches onto detail areas. Perform wet film thickness tests as work progresses to confirm thickness.

4. Horizontal Application Fluid Applied Membrane:

a. Detailing: Apply a minimum thickness of 60 mils, or as per manufacturer's drawings and written application instructions, over all detail areas (including inside corners, outside corners, pipe penetrations, cracks, construction joints, etc) prior to application of the field of the membrane
b. Apply a minimum thickness of 60 mils over all horizontal areas to be waterproofed and lapping a minimum of 4 inches onto detail areas. Perform wet film thickness tests as work progresses to confirm thickness.
c. Apply a second coat at a minimum thickness of 30 mils over first coat and completely covering all detail areas to give a minimum total thickness of 90

mils in the field and 150 mils at detail areas. Perform wet film thickness tests as work progresses to confirm thickness.

5. Horizontal Application Fluid Applied Membrane:

   a. Detailing: Apply a minimum thickness of 60 mils, or as per manufacturer's drawings and written application instructions, over all detail areas (including inside corners, outside corners, pipe penetrations, cracks, construction joints, etc) prior to application of the field of the membrane
   b. Apply a minimum thickness of 60 mils over all horizontal areas to be waterproofed and lapping a minimum of 4 inches onto detail areas. Perform wet film thickness tests as work progresses to confirm thickness.
   c. Apply a second coat at a minimum thickness of 60 mils over first coat and completely covering all detail areas to give a minimum total thickness of 120 mils in the field and 180 mils at detail areas. Perform wet film thickness tests as work progresses to confirm thickness.

6. Composite Sheet Membrane Application:

   a. Cut Procor Composite Sheet Membrane into manageable widths and lengths to achieve full horizontal coverage. Apply Procor Composite Sheet Membrane into wet or tacky Procor, geotextile side embedded into Procor. Apply pressure using a hand roller or broom to fully adhere Procor Composite Sheet Membrane for full contact into the Procor.
   b. Join adjacent sheets of Procor Composite Sheet Membrane by "butting" sidelaps.
   c. At sidelaps and endlaps, adhere a 12-inch wide strip of Bituthene Low Temperature Membrane, using a roller to provide fully contact to Procor Composite Sheet Membrane. Overlap Bituthene strips minimum 2 inches, apply in manner to provide watersheding effect.
   d. Treat all edges of Bituthene Membrane with Liquid Membrane.

3.4 WATER TEST

A. All areas of the deck shall be water tested by means of electronic testing or ponding to a minimum depth of 2 inches for a period of 24 hours to confirm the integrity of the membrane.
B. Allow the membrane to cure for a minimum period of 48 hours before starting water tests.
C. Before flood testing, be sure the structure will withstand the dead load of the water.
D. For well-sloped decks, segment the flood test to avoid deep water near drains.
E. Mark any leaks and repair according to manufacturer's repair procedures when the membrane is dry.

3.5 CURING, PROTECTING, AND CLEANING

A. Cure waterproofing according to its manufacturer's recommendations.
B. Take care to prevent contamination and damage during application stages and curing.
C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
D. Remove masking materials after installation. Clean stains on materials that would be exposed in the completed work.
E. Install a protection course as soon as possible after completion of the waterproofing installation and flood testing to protect the membrane from mechanical damage and UV.

F. Install protection, drainage and insulation courses according to the manufacturer's instructions.

END OF SECTION

SECTION 08 11 64 - WOOD-CLAD STEEL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Exterior steel door leafs with solid wood cladding.
2. Supplementary parts and components, such as inserts, clips, fasteners, anchors, and other miscellaneous supports required for a complete, weatherproof installation.

B. Work installed but furnished in other Sections: Division 8 for door hardware.

1.2 SUBMITTALS

A. Data: List of all manufactured and fabricated products, and components proposed for use.
B. Shop drawings - show the following:

1. Elevations.
2. Detail sections of typical composite members.
3. Hardware mounting heights.
4. Anchorages and reinforcements.
5. Expansion provisions.
6. Glazing details.
7. Show relative layout of adjacent wall components, beams, columns, slabs and ceilings, all correctly dimensioned.
8. Identify sealants by make and product name, and locate on shop drawings.
9. Identify welds, both shop and field, by AWS welding symbols.

C. Samples:

1. Submit not less than 12-inch long steel core with wood cladding. Identify samples gage, alloy, wood specie and cut, and finish.

    a. Approved wood sample will serve as Architect’s control sample.

D. Operation and maintenance manuals:

1. Complete manuals describing the materials, devices, and procedures to be followed in operating, cleaning, and maintaining the work.
2. Include manufacturer's brochures and parts lists describing the actual materials used in the work, including, but not limited to, metal alloys, wood, finishes, sealants, hardware, and other major components.
3. Assemble manuals for component parts in a single binder identifying content on spine and in a table of contents.

1.3 QUALITY ASSURANCE

A. Installer qualifications: Single firm, factory-trained, with a minimum of 3 years experience fabricating and erecting work similar to that required for this Project.

1.4 WARRANTY

A. Warrant work of this Section against defective materials and workmanship for 2 years after Substantial Completion.
B. Repair or replace, when repairs are acceptable to the Owner, defective materials and workmanship during the warranty period at no cost to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design is based on a steel-framed, wood-clad door by Pivot Door Company.
B. Equal door by other qualified manufacturers may be accepted, if approved by the Architect.

2.2 MATERIALS/ACCESSORIES

A. Core: Rigid steel grid made with one-inch thick steel tubing at 7 gage welded.
B. Insulation: Door manufacturer’s R-5 rigid insulation on each side of the grid.
C. Weatherproofing: Door manufacturer’s standard wind and waterproof membrane on each side of the insulation.
D. Wood facing and edging: Minimum 1/4-inch thick solid mahogany matching Architect’s control sample.
E. Sealants and back-up rods:

1. Within assembly: Manufacturer's standard non-drying, non-skinning sealant complying with AAMA 809.2.
2. Between assembly and adjacent materials: As specified in Section 07 92 00.

F. Weather Stripping: Manufacturer's standard Double Squeegee weather stripping at the top and bottom and side Compression kerf seals at each side.
G. Threshold: Aluminum Saddle as specified in Division 08.
H. Door frame: Jamb to be made out of the same Wood type as the door. Unless specified otherwise.
I. Hardware: See Door Hardware Section.

2.3 FABRICATION

A. Provide erection tolerances corresponding with specified tolerances for other work wherever field measurements cannot be obtained.
B. Fabricate and assemble this work with proper and acceptable provision for noiseless thermal expansion and contraction, fabrication and erection tolerances, adjoining building component tolerances and dynamic movements.
C. For surfaces exposed to view employ only materials free from alloy defects, die marks, scratches, streaks and other surface blemishes.
D. When using metal sheets use material light enough, but not less in thickness than specified, to permit workability but heavy enough to accurately retain the brake shape or contour without oil-canning when fastened to backing or blocking.

E. Complete the fabrication and assembly of the components in the shop to the greatest extent possible to minimize field cutting, splicing, fastening, sealing and finishing.

1. Disassemble only as necessary for shipment and erection.
2. Provide secure attachment and support at joints, with hairline, flush fit between contacting members.

F. Complete cutting, fitting, forming, drilling and grinding of metal before cleaning and finishing. Remove arises from cut edges and ease edges and corners to a radius of approximately 1/64-inch minimum, 1/32-inch maximum.

G. Welding:

1. Comply with industry standards for assembly and fabrication using system and rods for exposed metals which will provide texture match with materials being joined.
2. Grind exposed welds to be invisible from parent metal using clean grinding wheels of a type which will not result in stains or discoloration.

H. Hardware, including Threshold: As specified in Section 08 71 00.

I. Finishing:

1. Stainless steel: Finish with an AISI No. 4 polished finish with graining running with the long dimension of the component being finished.
2. Steel parts of anchors, anchor inserts, reinforcement and supports: Prime with rust-inhibitive primer.
3. Corrosion protection: Bituminous paint as specified in Section 05 50 00.

PART 3 - EXECUTION

3.1 PREPARATION

A. Stain and finish door and jamb prior to installing the assembly.

1. First coat: Stain-and-sealer, a combination of stain-and-sealer with an alkyd-resin base. Do not use a lacquer-based toner or any other lacquer-based finish.
2. Second and third coats (two top coats minimum): Water-borne (latex resin-base) clear finish. Do not apply below 50 degrees F, and allow for long drying period of several weeks.
3. Do not sand between coats of clear latex. All stain-and-clear finishes will perform measurably better if protected from the direct effects of sunlight and weathering, and refinishing will not be required as frequently.

B. Option for high exposure finish: Use an oil-based primer followed by at least 3 top coats of oil or latex-based paint on the exterior.

C. Paint all 6 faces using the same materials and methods.

3.2 EXAMINATION

A. Examine adjacent construction and supports.

B. Verify that opening is within allowable tolerances, plumb, level, clean, and will provide a solid anchoring surface.

C. Correct detrimental conditions before proceeding with installation.

3.3 INSTALLATION

A. General:

1. Follow door assembly manufacturer's instructions.
2. Do not install defective components, including warped, bowed, dented, abraded and broken members.
3. Remove and replace members which have been damaged during or after installation before final acceptance.
4. During installation do not cut, trim, or weld components exposed to view.
5. Return components which require alteration to the shop for refabrication or replacement.
6. Install assembly level, plumb, true to line and with uniform tight joints and reveals. Attach to structure with non-staining and non-corrosive shims, anchors, fasteners and spacers.
7. Provide all accessories such as fastenings, sealants and concealed anchorage needed for a complete weatherproof installation.

B. Erection tolerances:

1. Provide adjustment within the assembly to accommodate job variations.
2. Install the work of this Section within the following tolerances.

    a. Deviation from established vertical, horizontal, or designed position shall not exceed 1/8 inch/12 feet of length of any member, or 1/4 inch in any total run in any line.
    b. Maximum offset from true alignment between 2 consecutive members placed end-to-end shall not exceed 1/16 inch.

C. Assembly and anchorage:

1. Anchor components securely by bolting, welding or other permanent mechanical attachments system which will comply with specified requirements and permit movements which are intended or necessary.
2. Provide tape separator between contact surfaces of dissimilar materials where there is a possibility of corrosive or electrolytic action.
3. Remove weld slag and apply primer over welds. Touchup shop applied paint damaged by welding or other causes.

D. Hanging door:

1. Hang doors with minimum clearance to frame and threshold to meet the performance criteria specified.
2. Hang door and adjust hardware so door operates freely for its entire travel, without sticking or binding.

3.4 SEALANTS

A. The requirements of Section 07 92 00 apply to sealants used in this work.
B. Seal joints between door frame and adjacent construction to be weathertight.

END OF SECTION

SECTION 08 33 ~~16~~13 - OVERHEAD COILING COUNTER SHUTTER

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes manually-operated (~~push-up), aluminum~~chain) coiling counter shutter complete with hardware, ~~operators~~operator and accessories.

1.2 SUBMITTALS

A. Data: Manufacturer Product Data, including specifications, roughing-in diagrams, and installation instructions.

B. Shop drawings: For special components and installation conditions not fully dimensioned or detailed on ~~manufacturer~~manufacturer's data sheets. Show attachment details to adjacent construction.

~~C. Manufacturer instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.~~

~~D.~~C. Closeout: ~~Complete data~~Data for maintenance and operation of the shutter ~~(s).~~.

1.3 QUALITY ASSURANCE

~~A. Uniformity: Furnish all counter shutters made by one manufacturer.~~

A. ~~Installer's~~Fire resistance: Provide shutter assembly bearing UL label for the fire resistance indicated.

B. Installer qualifications: Shutter manufacturer or authorized distributor of the shutter manufacturer.

1.4 HANDLING

A. Protect finish components with clear plastic film or other form of protection to prevent damaging finish.

PART 2 - PRODUCTS

~~2.1 MANUFACTURER~~

2.1 TYPE/MANUFACTURER

A. Design is based on Model ~~CD8-1~~FD10 by ~~the~~The Cookson Co. ~~(basis~~

~~A.~~B. Equal assembly by one of ~~design).~~the following manufacturers may be accepted, if approved by the Architect:

~~B. Overhead Door Co.~~

~~C.~~1. ~~The Lawrence Co.~~

~~D.~~1. Cornell Iron Works.

2. Overhead Door Corp.

~~E.~~3. Pacific Rolling Door Co.

4. The Lawrence Co.

2.2 BASIC MATERIALS

A. Sheet steel: ASTM A 653 CQ or DQ, with a G90 galvanized coating.
~~A.~~B. Structural shapes and plates: ASTM A 36.
~~B. Tubular extruded aluminum: ASTM B 429, alloy 6063-T6.~~
~~C. Die cast aluminum: ASTM B 26/B 26M, alloy A356-T6.~~
~~D. Aluminum sheet: ASTM B 209, alloy 6061-T6.~~
~~E. Steel tubing: Cold-formed steel tubing: ASTM A 500.~~
~~F.~~C. Iron castings:

1. Gray cast iron: ASTM A 48.
2. Ductile cast iron: ASTM A 536.

2.3 COMPONENT MATERIALS

~~A. Door curtain: 0.050-inch thick extruded aluminum slats equal to Cookson No. 8.~~
~~B. Bottom bar: Tubular extruded aluminum with vinyl astragal.~~
~~C. Guides: 1-3/4-inch square extruded aluminum.~~
~~D. Brackets: 3/16-inch die-cast aluminum.~~
A. Endlocks: Heavy malleable iron castings.
B. Guides and guide supports: Hot-rolled steel sections.
C. Hood: 24-gage sheet steel.
~~E.~~D. Barrel: Steel ~~tubing~~pipe.
~~F. Hood: 0.040-inch thick aluminum.~~
~~G.~~E. Gears~~:~~: Cast iron.
F. Brackets: Cold-formed galvanized steel plates or hot-rolled sections.
G. Bottom bar: Tubular steel.
H. Curtain slats: 22-age steel; style equivalent to slat No. 10 by the Cookson Co.

2.4 FINISH MATERIALS

A. Pretreatment for primer: Phosphate coating in compliance with manufacturer's standard.
B. Primer: Manufacturer's standard rust-inhibitive primer applied to a minimum of one mil DFT.
C. Finish coat: Thermo-setting polyester, each side, 0.6 mil DFT.

~~2.4~~2.5 FABRICATION

A. Curtain:

1. Fabricate with endlocks securely attached to both ends of alternate slats with a minimum of 2 galvanized rivets.
2. Reinforce top slat as required by UL listing.
~~A.~~3. Provide a tubular bottom rail attached to the lower slat~~, including a double vinyl astragal on the bottom edge~~.

B. Guides: ~~Extruded aluminum members, each side of the channel portion capturing~~Tubular steel profiles forming a groove for the curtain, and extended above counter shutter opening to support coil brackets.
C. Brackets: Manufacturer standard design, with bellmouth guide groove for curtain.
D. Gears:

1. Cast iron with teeth cast from machine cut patterns.
2. The pinion gears shall ~~contain wool pile weatherstripping~~not be less than 3-inch pitch diameter.

B.3. Gear ratio shall be designed for a maximum manual effort of 30 lbs.

C.E. Barrel:

1. Not less than 4-inch diameter steel tubing designed to limit maximum deflection, when fully loaded with door in the retracted position, to 0.03-inch/foot.
2. Oil-tempered torsion springs shall be capable of correctly counterbalancing weight of curtain and be adjustable by an exterior wheel.

D. Hood: Fabricate from aluminum sheet, formedSquare steel box attached securely to fit the die cast brackets.

2.5 FINISHING

A.F. Finish exposed aluminum surfaces with Provide a clear anodized finish complying with NAAMM M12C22A31hood flame baffle as required by UL listing.

2.6 OPERATION

A. ManualFire mode: Shutter shall have an automatic closing device and governor to regulate the downward speed to be released by building life safety system.

A. Normal operation:

1. Push-up type with finger slots in bottom rail.

2.B. Interior, and an interior slide bolt or thumb-turn lockslock for locking the shutter when closed.

PART 3 - INSTALLATION

3.1 EXAMINATION

A. Examine adjacent construction and supports.
B. Verify that opening is within allowable tolerances, plumb, level, clean, will provide a solid anchoring surface and sufficient support for the assembly.
C. Correct detrimental conditions before proceeding with installation.

3.2 INSTALLATION

A. Install shutter and its operating equipment in compliance with the shutter manufacturer's published instructions, plumb, and square, in true alignment, free of springing, forcing, racking or distortion.
B. Provide necessary hardware, jamb and head mold stops, anchors, inserts, hanger, equipment supports and other accessories required for a complete installation.
C. Attach guide assembly to walls for a rigid installation. Place anchor bolts to be concealed from security side when shutter is closed.
D. When the installation is complete, lubricate, test and adjust the shutter to operate easily, free from warp, twist or distortion with a tight fit for the entire perimeter.

3.3 TOUCHUP

A. Touchup damaged surfaces when the results are acceptable to the Architect; otherwise return damaged component to the shop for refinishing.

END OF SECTION

SECTION 08 43 13 - ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Exterior fixed aluminum-framed storefront panels with spandrel glass (placeholder for future Outdoor Digital Displays.)
2. Mullion covers, subframes, reinforcement and anchors, and sealants for the work of this Section.
3. Glass and glazing for the work of this Section.

B. Related requirements: Division 08 for glazing requirements for the work of this Section.

1.2 SUBMITTALS

A. Data: List of manufacturers' Product Data.
B. Shop Drawings:

1. Large scale dimensioned Shop Drawings for the work of this Section showing elevations and anchorage details.

C. Sample: Cutaway Sample of vertical-to-horizontal framing intersection of storefront, made from minimum 6-inch lengths of full-size components and showing details of the following.

a. Joinery.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Identify Samples gage, alloy, color and finish.
f. Flashing and drainage.

D. Calculations: Prepare calculations in compliance with current design rules of AA, AISC, AISI, and ACI. Include analysis for wind and dead load on framing members, anchors, and concrete inserts.
E. Certified test results: Certified test results showing that assemblies have been tested by a recognized testing laboratory or agency and comply with specified performance characteristics.

1.3 HANDLING

A. Procedure: In accordance with "Care and Handling of Architectural Aluminum from Shop to Site" published by AAMA.

1.4 WARRANTY

A. Special assembly warranty: Manufacturer agrees to repair or replace components that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period. Repair or replace, when repairs are acceptable to the Owner, defective materials and workmanship during the warranty period at no cost to the Owner.

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

a. Penetration of water into the building thru storefront.

b. Air infiltration for storefront exceeding specified limits.
c. Structural failure of components resulting from forces within specified limits.
d. Discoloration or fading, excessive non-uniformity, pitting, cracking, peeling, or crazing of finish or corrosion.
e. Failure to fulfill other specified performance requirements.

2. Warranty period: 10 years from Substantial Completion, except 20 years for finish.

NOTE: The terms below used in conjunction with finish warranty above are defined as follows.

a. "Excessive fading": A change in appearance which is perceptible and objectionable as determined by the Architect when viewed visually in comparison with the original color range standards.
b. "Excessive non-uniformity": Non-uniform fading during the period of the guarantee to the extent that adjacent parts have a color difference greater than the original acceptable color range.
c. "Will not pit or otherwise corrode": There shall be no pitting or other type of corrosion discernible from a distance of 10-foot, resulting from the natural elements in the atmosphere at the Project site.

B. Sealants: Refer to Section 07 92 00.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

A. Structural performance: Design, engineer, fabricate, and install storefront to withstand structural loads indicated.

1. Limit deflection of framing members normal to wall plane to 1/175 of clear span or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Limit deflection of framing members parallel to glazing plane to L/360 of clear span or 1/8 inch, whichever is smaller.

B. Structural testing: Systems tested according to ASTM E 330 at 150 percent of inward and outward wind-load design pressures do not evidence material failures, structural distress, deflection failures, or permanent deformation of main framing members exceeding 0.2 percent of clear span.

C. Air infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. -foot of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 psf.

D. Water penetration under static pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 psf.

E. Water penetration under dynamic pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 psf.

1. Maximum water leakage: No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by

flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.

F. Thermal transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
G. Condensation resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.
H. Load transfer: Framing members shall not transfer stresses, including those caused by thermal and structural movement, to glazing units.
I. Glazing: Physically and thermally isolate glazing from framing members.

2.2 MANUFACTURERS

A. Arcadia, Inc.
B. EFCO Corp.
C. Kawneer Co., Inc.
D. Tubelite Architectural Systems.
E. Old Castle Building Envelope.

2.3 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated; ASTM B 209 for sheet; and ASTM B 221 for extrusions.
B. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
C. Construction: Thermally broken, unless otherwise indicated.
D. Steel mullion reinforcement, if required by wind loading and other considerations: Proprietary bent steel plate or structural steel shape complying with the following.

1. Hot-rolled sections: ASTM A 36.
2. Structural tube framing: ASTM A 500, Grade B.

E. Fasteners:

1. General: Aluminum, non-magnetic stainless steel or other materials warranted by the manufacturer to be non-corrosive and compatible with aluminum components, hardware, anchors and other components.
2. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125-inch thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
3. Exposed fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners. For the application of hardware, use fasteners that match the finish of member or hardware being fastened.

a. Provide Phillips flat-head machine screws for exposed fasteners.

F. Welding electrodes: As recommended by AWS for the type of metal to be welded and the conditions of use.
G. Brackets: Where feasible, provide high-strength aluminum brackets and reinforcements; otherwise provide non-magnetic stainless steel or steel complying with ASTM A 386.
H. Shims: Use high impact polystyrene solid shims.
I. Glass and glazing materials: As indicated on the Drawings and specified in Section 08 80 00.
J. Sealants and backup rods:

1. Glazing sealants: Refer to Section 08 80 00.
2. Within assemblies: Manufacturer standard non-drying, non-skinning sealant complying with AAMA 809.
3. Between assemblies and adjacent materials: As specified in Section 07 92 00.

K. Isolation tape:

1. Tremco 440.
2. 3M EC1202.
3. Tremco Presstite 579.6.

L. Foam insulation: Closed-cell polyurethane. Use in mullions and closure pieces that cannot be insulated during or after assembly.
M. Finish of exposed surfaces: Class I, color anodic finish complying with AAMA 611.
N. Shop primer for ferrous metal: Manufacturer or fabricator standard, fast-curing, lead-free, universal rust-inhibitive alkyd primer complying with performance requirements of FS TT-P645.
O. Shop primer for concealed aluminum surfaces: Alkyd barium metaborate made by one of the manufacturers listed in Section 09 90 00, or bituminous paint.
P. Galvanizing repair paint: SSPC Paint No. 20, Type II (Organic), by Tnemec, Porter International, Valspar Corp., Ameron Protective Coatings, or DuPont Co.

2.4 FABRICATION

A. Furnish Shop Drawings, inserts and similar items to other trades, at appropriate times as required for proper sequence of construction.

1. Verify dimensions of the supporting structure and other elements that precede this work before fabrication of the required components.
2. Provide erection tolerances corresponding with specified tolerances for other work wherever field measurements cannot be obtained.

B. Maintain the visual design concept shown, including member sizes, profiles and alignment of components.
C. Fabricate and assemble components with proper and acceptable provision for noiseless thermal expansion and contraction, fabrication and erection tolerances, adjoining building component tolerances, and dynamic movements.
D. Fabricate and assemble components with minimum perimeter clearances and shim spacing, but enable installation and dynamic movement of perimeter seals.
E. Removable members such as glass stops, fillers or closures shall be extruded, and securely engaged into adjacent components. Fabricate extrusions to eliminate edge projection, bowing, and misalignment at joints.
F. Design and construct expansion joints so that they will be, and remain, permanently watertight, and will accommodate weather and building dynamics.
G. For surfaces exposed to view employ only materials which are free from alloy defects, die marks, scratches, streaks and other surface blemishes.
H. When using aluminum sheets, use material light enough to permit workability but heavy enough to accurately retain the brake shape or contour without oil-canning when fastened to backing or blocking.
I. Complete the fabrication and assembly of the components in the shop to the greatest extent possible to minimize field cutting, splicing, fastening, sealing and finishing.

1. Maintain provisions for expansion and movement.
2. Disassemble only as necessary for shipment and erection.
3. Provide secure attachment and support at joints, with hairline, flush fit between contacting members.

J. Complete the cutting, fitting, forming, drilling and grinding of metal before cleaning and applying specified finish. Remove arrises from cut edges and ease edges and corners to a radius of approximately 1/64-inch minimum, 1/32-inch maximum.
K. Welding:

1. Comply with industry standards for assembly and fabrication using system and rods for exposed metals that will provide texture match with materials being joined.
2. Grind exposed welds smooth and flush with parent metal using clean grinding wheels of a type that will not result in stains or discoloration.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.
B. Verify that openings are within allowable tolerances, plumb, level, clean, will provide a solid anchoring surface.
C. Examine wall flashings, water and weather barriers, and other built-in components to ensure coordinated, weathertight installations.
D. Correct detrimental conditions before proceeding with installation.

3.2 INSTALLATION

A. General:

1. Do not install defective components, including warped, bowed, dented, abraded and broken members, and glass with damaged edges.
2. Remove and replace members that have been damaged during installation or thereafter before final acceptance.
3. Do not cut, trim, or weld components during erection in a manner that would damage the finish, decrease their strength, or result in a visual imperfection or a failure in performance of the work.
4. Return components that require alteration to the shop for refabrication or replacement.
5. Install components level, plumb, true to line and with uniform tight joints and reveals. Attach to structure with non-staining and non-corrosive shims, anchors, fasteners and spacers.
6. Provide all accessories such as fastenings, sealants and concealed anchorage needed for a complete weatherproof installation.
7. Protect unpainted aluminum surfaces that will be in contact with cementitious and dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

B. Erection tolerances:

1. Provide adjustment within the assemblies to accommodate job variations.
2. Install the work of this Section within the following tolerances:

a. Deviation from established vertical, horizontal, or designed position shall not exceed 1/8-inch in 12 feet of length of any member, or 1/4-inch in any total run in any line.
b. Maximum offset from true alignment between 2 consecutive members placed end-to-end shall not exceed 1/16-inch.
c. Maximum offset between glass framing members at corners of glazing pocket must not exceed 1/32-inch.

C. Assembly and anchorage:

1. Anchor components securely by bolting, welding or other permanent mechanical attachments system that will comply with specified requirements and permit movements that are intended or necessary.
2. Install slip-joint linings where required to ensure movement without damage of the components.
3. Provide tape separator or asphalt paint between contact surfaces of dissimilar materials where there is a possibility of corrosive or electrolytic action, but in all cases between dissimilar metals and where aluminum will contact with cementitious materials.
4. Remove weld slag and apply primer over welds. Touchup shop applied paint damaged by welding or other causes.

D. Glazing:

1. Glaze assemblies as specified in Section 08 80 00.
2. Carefully match joints of glazing beads.

3.3 SEALANTS

A. The requirements of Section 07 92 00 apply to sealants used in this work. Seal all joints between the work of this Section and adjacent construction to be weathertight.

3.4 FIELD QUALITY CONTROL

A. Field water tests may be performed on completed glazed portions of the exterior storefronts at the Owner's option in compliance with ASTM E 1105.

1. Provide hose and sufficient personnel to conduct the tests.
2. In the event that such testing should result in uncontrolled leakage, eliminate the causes of such leakage at no additional cost to the Owner.

B. Touchup: Touchup damaged finish when results are satisfactory to the Architect, otherwise return the damaged component to the shop for refinishing.

END OF SECTION

SECTION 08 51 23 – FIRE-RATED WINDOW

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Fixed fire-rated steel window.

1.2 SUBMITTALS

A. Data: Manufacturer data for the window.
B. Shop drawings:

1. Large scale dimensioned shop and erection drawings for the work of this Section showing the following:

    a. Elevations.
    b. Detail sections of typical composite members.
    c. Anchorages and reinforcements.
    d. Expansion provisions.
    e. Glazing details.

2. Show relative layout of adjacent construction, all correctly dimensioned.
3. Identify shop and field sealants by product name and locate on Shop Drawings.
4. Identify welds, both shop and field, by AWS welding symbols.

C. Samples: Metal Samples, consisting of a corner Section, with legs than 12 inches long, complete with glass (may be plexiglass) and glazing gasket, typical of the construction, all with specified finish and color.
D. Certification: Manufacturer certification and test reports that window shipped to the site meets the requirements of these Specifications.
E. Manufacturer's Warranty: Submit manufacturer's standard warranty document.

1.3 QUALITY ASSURANCE

A. Installer’s qualifications: Firm with a minimum of 3 years’ experience in installation of fire rated windows similar to those specified and whose work has resulted in construction with a record of successful in-service performance.
B. Source Limitations for Glazing Accessories: Obtain framing system, glazing and glazing accessories from one source for each product and installation method indicated.
C. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257. Assemblies must be factory-welded or come complete with factory-installed mechanical joints and must not require job site fabrication.
D. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by an approved independent agency maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

1.4 HANDLING

A. Delivery: Deliver materials to specified destinations in manufacturer's or distributor's packaging undamaged, complete with installation instructions.
B. Storage and Protection: Store off ground, under cover, protected from weather and construction activities and at temperature conditions recommended by manufacturer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Duration of Fire Rating: Capable of providing a fire rating for 90 minutes as defined by UL 9, UL 10C, and UL 0B.
B. Comply with NFPA 251 and NFPA 252.
C. Testing Laboratory: Fire test shall be conducted by a nationally recognized independent testing laboratory.

2.2 LISTINGS AND LABELS

A. Fire rated window shall be under current follow-up service by a nationally recognized independent testing laboratory approved by OSHA and maintain a current listing or certification.

1. Window shall be labeled in accordance with limits of listings.

2.3 MANUFACTURER

A. SAFTIFirst Fire Rated Glazing Solutions (www.safti.com).

2.4 MATERIALS

A. Glazing materials: “SuperLite TM X-90, 90-minute fire protective and safety-rated glazing at exhibit window with the following properties:

1. Thickness: 3/4 inch.
2. Weight: 9.0 lbs./sq.ft.
3. Fire Rating: 90 minutes with hose stream.
4. Impact Safety Resistance: CPSC 16 CFR 1201 Cat. II.
5. Glazing material installed in “Hazardous Locations” (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.

    a. Glazing materials shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80:

6. Logo: Each piece of fire rated glazing shall be labeled with a permanent logo, including name of product, manufacturer, testing laboratory, fire rating period and safety glazing standards.

    a. CPSC 16 CFR 1201, Category II

B. Framing systems: SAFTIfire HM GPX Framing rated for 90 minutes for use in window, constructed from new billet steel with flanges rolled integral at the mill in accordance with the individual manufacturer's listings or in accordance with HMMA 861-06 and HMMA 850.
C. Sealants: As specified in Section 07 92 00.
D. Finishes:

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Primed for filed paint. Finish frames after assembly.

3. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
4. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.5 FABRICATION

A. Prior to fabrication, clean hot rolled steel sections by shot blasting.
B. Fabricate window in accordance with approved Shop Drawings, to a tolerance of plus or minus 1/16-inch in any dimension, free of rack, and with flush, hairline joints.
C. Miter or cope corners and weld solidly.
D. Glazing:

1. Sash shall be designed for inside glazing.
2. Provide continuous screw on 14-gage steel glazing beads to suit glass indicated and specified.
3. Use glazing material and glass bites indicated on the approved Shop Drawings to maintain the rating.

E. Finish: To be determined.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.
B. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
C. Verify that openings are within allowable tolerances, plumb, level, clean, will provide a solid anchoring surface.
D. Correct detrimental conditions before proceeding with installation.

3.2 INSTALLATION

A. Do not install components that are bowed, dented, abraded, broken or otherwise defective.
B. Install window level, plumb, square and with tight fitting joints.
C. Attach to supporting construction with non-staining and non-corrosive shims, anchors, fasteners and spacers.
D. Provide accessories such as fasteners, sealants and concealed anchorage needed for a complete weatherproof installation.
E. Install glazing in accordance with fire resistant glazing material manufacturer's specifications and UL/NFPA tested assemblies.
F. Field cutting or tampering is not permissible.

3.3 FIELD QUALITY CONTROL

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove non-permanent labels, and clean surfaces.
B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
D. Touchup damaged finish to match and be invisible from adjacent undamaged surfaces, when the results are satisfactory to the Architect, otherwise return the damaged component to the shop for refinishing.

END OF SECTION

SECTION 08 55 13 - ALUMINUM-FRAMED WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Fixed aluminum windows.
2. Glass and glazing for the work of this Section.

B. Related requirements: Other Sections of Division 08 for the following.

1. Sliding aluminum doors.
2. Fixed aluminum-framed storefronts and their entrances.

1.2 SYSTEM DESCRIPTION

A. System performance requirements:

1. General: Provide windows that comply with performance requirements specified, as demonstrated by testing manufacturer's corresponding stock systems according to test methods indicated.
2. Design requirements:

a. Comply with structural performance, air infiltration, and water penetration requirements indicated in AAMA/NWWDA 101 for the window types indicated.
b. Comply with Code for design wind velocity at the Project site.

3. Forced-entry resistance: Provide units that comply with requirements for Performance Level 10 when tested in compliance with ASTM F 588, unless more restrictive requirements are mandated by Code.

1.31.2 SUBMITTALS

A. Data:

1. Product data for the window. each type of window required, including the following.
2. Construction details and fabrication methods.
3. Profiles and dimensions of individual components.
4. Data on hardware, accessories, and finishes.
5. Recommendations for maintenance and cleaning of exterior surfaces.

B. Shop drawings: For each type of window required, include Include information not fully detailed in manufacturer's standard Product Data and the following.

1. Layout and installation details, including anchors.
2. Elevations of continuous work at 1/4-inch scale and typical window unit elevations at 3/4-inch scale.
3. Full-size section details of typical composite members, including reinforcement.

4. Interface with adjacent materials/assemblies, including method of bridging gaps between frame of ~~glazed assemblies~~the window and the adjacent materials. Unless otherwise indicated on the Drawings, single line of sealant to prevent air and water infiltration may be rejected by the Architect; flexible, self-adhered flashings are preferred.
~~5. Hardware including operators.~~
~~6.~~5. Glazing details.
~~7. Accessories.~~

C. Samples:

1. Specified finish on 12-inch long section~~s~~ of a frame ~~window~~ member~~s, and a 12-inch corner sample of the insect screens; include screen fabric.~~.
2. Where finish~~e~~s involve normal color variations, include sample sets showing the full range of variations expected.
3. Approved samples will serve as Architect's control samples.

D. Certification:

1. By a recognized independent testing laboratory or agency showing that ~~each type,~~ grade, and size of unit complies with performance requirements indicated.
2. Where reports are not available, engage a recognized independent testing laboratory or agency to perform tests specified. Provide certified test results showing that ~~each type, grade, and size of~~ unit complies with performance requirements indicated.

~~1.4~~1.3 QUALITY ASSURANCE

A. Installer qualifications: Firm who has successfully completed installation of aluminum windows similar in design and extent to ~~those~~ that required for the Project for a minimum of 3 years.
B. Standards: Requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in AAMA 101 and applicable general recommendations published by AAMA.
~~C. Single-source responsibility: Provide aluminum windows from one source and produced by a single manufacturer.~~

~~1.5~~1.4 HANDLING

A. Storage: Off the floor in a protected location.

PART 2 - PRODUCTS

2.1 MANUFACTURER/TYPE

A. ~~To be determined~~Arcadia Inc., Basis of design.~~.~~
B. CR Laurence.
C. EFCO Corporation.
~~A.~~D. Or Equal.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by the manufacturer for strength and application of required finish, complying with ASTM B 221 for extrusions and ASTM B 209 for sheet or plate.

B. Fasteners: Aluminum, non-magnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be non-corrosive and compatible with aluminum window members, ~~trim, hardware,~~ anchors, and other components of window unit~~s~~.

1. Reinforcement: Where fasteners screw-anchor into aluminum is less than 0.125-inch thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads or provide standard non-corrosive pressed-in splined grommet nuts.
2. Exposed fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners. ~~For hardware, use fasteners that match the finish of the member or hardware being fastened, as appropriate.~~

C. Anchors, clips, and window accessories: Aluminum, non-magnetic stainless steel, or hot-dip zinc-coated steel or iron complying with the requirements of ASTM B 633; provide sufficient strength to comply with design criteria.

D. Compression type glazing strips and weatherstripping: One of the following.

1. Molded EPDM or neoprene gaskets complying with AAMA SG-1 or with ASTM D 2000 Designation 2BC415 - 3BC620.
2. Molded PVC gaskets complying with ASTM D 2287.
3. Molded expanded EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.

~~E. Sliding type weatherstripping:~~

~~1. Woven pile weatherstripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric.~~
~~2. Comply with AAMA 701.2.~~
~~3. Provide stripping with integral centerline barrier fin of semi-rigid plastic sheet of polypropylene.~~

~~F.~~E. Glass and glazing materials: As indicated on the Drawings and specified in Section 08 80 00.

~~G.~~F. Sealants and backup rods:

1. Within assembl~~y~~lies: Manufacturer's standard non-drying, non-skinning sealant complying with AAMA 809.2.
2. Between assembl~~y~~ies and adjacent materials: As specified in Section 07 92 00.
3. Glazing sealants: Refer to Section 08 80 00.

~~H. Wire fabric insect screen: Window manufacturer's standard, match Architect's control sample.~~

~~I. Hardware: Manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.~~

2.3 CONSTRUCTION

A. General:

1. Fabricate windows to comply with indicated standards.
2. Fabricate frame and sash square, without rack, and with flush, hairline joints.
3. Equip ventilators with weatherstripping to prevent water and air infiltration.
4. Sash members shall be contained within frame members, so that total sight line of sash and frame does not exceed the frame sight line.

B. Provide units that are reglazable without dismantling sash or ventilator framing.

C.B. Provide subframes with anchors, where shown, of profile and dimensions indicated but not less than 0.062-inch extruded aluminum.

D.C. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window.

E.D. Provide mullion, sills and cover plates, matching window units, complete with anchors for support to structure and installation of the windows.

F.E. Allow for erection tolerances and provide for movement of window due to thermal movement and building deflections.

G. Finish:

F. Sight-exposed aluminum surfaces: To be determinedPrefinish exposed aluminum surfaces with a factory-applied high-Performance Organic Finish (2-coat fluoropolymer) as follows.

a. AA-C12C40R1x with PPG, standard 2-coat, thermocured system consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight.

1.b. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' instructions.

2. Steel brackets: Hot-dip galvanize and coat with rust-inhibitive primer.

H.G. Glazing:

1. Factory glaze windows.
2. Comply with the glass manufacturer recommendations and the requirements of Section 08 80 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.
B. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
C. Verify that openings is are within allowable tolerances, plumb, level, clean, will provide a solid anchoring surface.
D. Correct detrimental conditions before proceeding with installation.

3.2 INSTALLATION

A. Do not install components that are bowed, dented, abraded, broken or otherwise defective.
B. Install windows level, plumb, square and with tight fitting joints. Attach to supporting construction with nonstaining and non-corrosive shims, anchors, fasteners and spacers as shown on approved Shop Drawings.

C. Set sill members in a bed of compound or with joint fillers or gaskets to provide weathertight construction.

1. Refer to Section 07 92 00 for compounds, fillers, and gaskets to be installed concurrently with window~~s~~.
2. Coordinate installation with wall flashings and other components of the work.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with the requirements specified under "Dissimilar Materials" in the Appendix to AAMA 101.

E. Provide all accessories such as fasteners, sealants and concealed anchorage needed for a complete weatherproof installation.

~~F. Adjust ventilators to assure smooth operation.~~

~~1. Units shall be weathertight when closed.~~
~~2. Lubricate hardware and moving parts as required.~~
~~3. Weatherstrips shall not bind or prevent sash or ventilator from closing easily and tight with weathertight contact between metal.~~

~~3.3 DEMONSTRATIONS~~

~~A. Manufacturer shall provide window maintenance instructions and minimum of one on-site visit to assure proper operation of units.~~

END OF SECTION

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SECTION 08 80 00 - GLASS AND GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. All glass and glazing for the Project except as noted below.
2. Glazing accessories.
3. Glazing sealants.

B. Related requirements:

1. Division 10 for framed mirrors.
2. Glass and glazing in equipment such as fire hose cabinets.

1.2 DESCRIPTION

A. Performance requirements for glass:

1. Glass shall not experience spontaneous breakage.
2. Glass center deflection relative to glass edges at 50 percent of design pressures shall not exceed one-inch Glass deflection at 150 percent of design pressures shall be limited to prevent disengagement from frame.
3. Examine heat-strengthened and tempered glass and discard any lights which exceed the tolerances allowed by the reference standards.
4. Where the strengthening process results in essentially parallel ripples or waves, the deviation from flatness at any peak shall not exceed 0.005-inch, and the difference between adjacent peaks shall not exceed 0.003-inch.
5. Where bow tolerance and wave tolerance differ, the stricter requirement shall govern.
6. Direction of ripples shall be consistent.

1.3 SUBMITTALS

A. Certificate: Certificate stating that the glass furnished for the Project complies with the Specifications.

1.4 QUALITY ASSURANCE

A. Labeling:

1. Label each piece of heat-treated glass with a permanent logo etched in one corner to identify the fabricator.
2. Provide NFRC Rating Labels as required by 2005 California Energy Code. Reference 2005 compliance guide for information required.

B. Glass thickness and temper:

1. Where not specified or indicated glass thickness and temper is the Contractor's responsibility. In its selection, the Contractor shall be guided by these Specifications, Code provisions (for glass subject to human impact), and live loads and other stresses which may affect the glass performance.
2. For the purpose of glass selection, design wind pressure shall be assumed to have one-minute duration.
3. In addition to other criteria, glass shall be designed to sustain, at maximum wind loading prescribed by Code, but not less than 20 psf, a statistical glass breakage not exceeding 8 lites per 1000 lites.
4. Submit the glass manufacturer's wind load and thermal stress analysis showing that the maximum probability of glass breakage will not exceed the ratio specified above, for exterior glass.

C. Fire-protection-rated glazing labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450-degree F, and the fire-resistance rating in minutes.

D. Safety glass:

1. Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
2. Subject to compliance with the above, provide a permanent mark on safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to AHJ.

E. Spandrel glass: Spandrel glass with an opacifier shall meet the fall-out resistance of the Glass Tempering Association Specification No. 89-1-6, “Specification for Environmental Durability of Fully Tempered or Heat-Strengthened Glass with Applied Opacifiers”.

1.5 WARRANTY

A. Warrant coating and ceramic frit on spandrel glass against cracking, peeling, wrinkling, color fading, blistering, flaking, delaminating, staining and discoloration for 10 years after Substantial Completion.

~~A.~~B. Glass shall not experience spontaneous breakage.

1. This Specification defines nickel sulfide stones as a glass material defect.
2. Installed tempered glass which breaks due to nickel sulfide stones shall be included in the warranty.

~~B.~~C. Replace defective materials and workmanship during the warranty period at no cost to the Owner.

PART 2 - PRODUCTS

2.1 GLASS

A. General:

1. Float glass: Conform to ASTM C 1036.
2. Heat-treated glass: Conform to ASTM A 1048.

a. Tempered glass shall be tempered horizontally; mark glass as specified above identifying it as tempered glass.

3. ANSI Z97.1 American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications Method of Test.
4. US Consumer Product Safety Commission CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials
~~3.~~5. Glass in hazardous locations: Comply with Code and the Drawings.
~~4.~~6. Glass thickness: Unless otherwise indicated or specified, overall thickness of each glass type shall be consistent throughout the Project.

B. Glass types: As scheduled on the Drawings.

2.2 MISCELLANEOUS GLAZING MATERIALS

A. Setting block and spacers: As recommended by the glass and glazing sealant manufacturers and compatible with sealants used.
B. Sealants: General Electric Silglaze, or Dow Corning 795 or 999.
C. Glazing gaskets: Molded resilient continuous neoprene, silicone, or EPDM extrusions, 40 - 60 Shore A durometer hardness, meeting the requirements of ASTM C 509 for cellular (closed-cell) material, and AAMA SG-1 for non-cellular (dense) material.
D. Compressible filler rod:

1. Closed-cell or waterproof jacketed rod stock of synthetic rubber or plastic foam compatible with sealants used, flexible and resilient, with 5 - 10 psi compressive strength at 25 percent deflection.
2. Do not use vinyl foam stock.

E. Cleaner, primer and sealer: Type recommended by sealant or gasket manufacturer.
F. Glass coating for sandblasted surfaces: CLO Ritec “ClearShield Coating" by CLO Glass Ltd.

2.3 FABRICATION

A. Cutting:

1. Obtain sizes from Shop Drawings or by field measurement. Cut glass to fit each opening with at least the minimum edge clearance and bite on glass recommended by glass manufacturer.
2. When glass is to be precut to sizes obtained from Shop Drawings, take field measurements of each opening before glazing to verify adequate bite on glass and minimum edge clearance. Glaze openings which do not fall within tolerances for which precut glass has been sized only with glass specially cut to fit such openings.
3. Do not nip glass edges. Edges may be wheel cut or sawed and seamed at manufacturer's option.
4. Do not cut, seam, nip, or abrade tempered and heat-strengthened glass after tempering.
5. Provide flat ground edges with arrised corners where glass edge is not covered by a metal stop.

B. Identification: Identify tempered glass with a manufacturer-installed, removable paper designation as required by CBC section 2406.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
2. Joint intersections to insure that the offset in the joinery will not impose undue edge pressure on the glass.
3. Minimum required face or edge clearances.
4. Observable edge damage or face imperfections.

B. Correct unsatisfactory conditions before proceeding with glazing.
C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 STANDARDS AND PERFORMANCE

A. Watertight and airtight installation is required for each piece of glass installed in an exterior wall or skylight.
B. Each installation must withstand normal temperature changes, wind loading, and impact from normal operation for doors and windows, without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the Work.
C. Installed glass shall be free from rattle.
D. Protect glass from damage at all times during handling, installation and operation of the building until Substantial Completion.
E. Comply with combined recommendations of glass manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are specified.
F. Comply with GANA, Glazing Manual, and Sealant Manual, guidelines, except as recommended otherwise by the manufacturers of the glass and glazing materials.

3.3 CURING/PROTECTING/CLEANING

A. Cure glazing sealants and compounds in compliance with their manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.
B. Protect glass from breakage immediately upon installation. Do not apply markers of any type to glass.
C. Before Substantial Completion, remove and replace glass which is broken, chipped, cracked, abraded, stained or damaged in other way, including natural causes, accidents and vandalism.
D. Maintain glass in a clean condition during construction so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other work.
E. Remove remaining labels and wash and polish glass on both faces not more than 4 days prior to Owner's acceptance of the work in each area. Comply with GANA 01-0300 and the glass manufacturer's recommendations.

END OF SECTION

SECTION 09 24 00 - LATH AND PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Metal lath and lathing accessories.
2. Portland cement plaster, including scratch and brown coat behind exterior stone veneer.

B. Related requirements: Division 07 for the Air and Water Barrier behind the plaster systems.

1.2 SUBMITTALS

A. Data: Manufacturer's Product Data for plaster fiber reinforcement, lath and accessories.
B. Preliminary Samples: 24 in. square Samples mounted on gypsum board or plywood showing texture to be expected in the Work.

1.3 QUALITY ASSURANCE

A. Sample panel:

1. Provide at the Project site, where directed, a 6 feet high by 6 feet wide sample panel with 2-foot returns, representative of the plaster texture and color to be expected on the Project, mounted on lath/gypsum base/ steel studs, complete with trim, for the Architect's review.

    a. Finish panel to match the preliminary sample panel available for the Contractor's review in the Architect's office. Provide a control joint at mid-height.
    b. Repeat sample panel until Architect's approval is obtained.
    c. Protect approved panel, which will be used as a standard for the Project, until its removal is authorized.

2. After the sample panel is approved, start application of the plaster on the building where directed by the Architect.
3. Obtain Architect's approval of a panel full height on the building before proceeding further.

1.4 HANDLING

A. Store aggregates on clean platforms and cover with plastic sheeting to exclude dirt and other foreign materials that would adversely affect the plaster.
B. Keep metal lath and accessories dry and off the ground.

1.5 JOB CONDITIONS

A. Protect adjacent surfaces from damage as a result of plastering operations.
B. Protect plaster against extreme climatic conditions, including uneven and excessive evaporation from hot dry air.
C. Do not leave weather barrier exposed to the elements longer than recommended by its manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plastering materials:

1. Portland cement: ASTM C 150, Type I or II. Use only one brand throughout this work.
2. Hydrated lime: ASTM C 206, Type S.
3. Sand: ASTM C 897 or ASTM C 144, graded as follows, except for finish coat.

	Percentage retained on each sieve	
Sieve Size	Max.	Min.
No. 4	0	0
No. 8	10	0
No. 16	40	10
No. 30	65	30
No. 50	90	70
No. 100	100	90
No. 200	100	97

4. Fiber reinforcement: 1/2 in. long chopped glass fiber strands Type AR by Owens-Corning Corp., Dur-O-Fibar by Dur-O-Wall, Inc., or Cem-Fil by Pilkington, or 1/2 in. chopped polypropylene fibers by Fibermesh Co. or Fiber Con, Inc.
5. Water: Potable, fresh from domestic source.
6. Pre-mixed, integrally colored finish coat: By La Habra Products, Inc., Highland Stucco, Omega Stucco, Thoro System Products, or equal of the custom color selected by the Architect.
7. Paper weather barrier: Complying with UBC 94 Standard y14-1 and FS UU-B-790, Type I, Grade D (vapor permeable), Style 2, except with a water resistance of 60 minutes; Fortifiber Corp. "Super Jumbo Tex" or equal.

    a. As an alternate to the paper weatherbarrier, the Contractor may use Tyvek StuccoWrap with Tyvek HouseWrap tape by DuPont.

8. Lath: Expanded diamond mesh lath weighing 3.4 lbs./ sq. yd. made from uncoated or zinc-coated (galvanized) steel sheet to produce lath complying with ASTM C 847, with uncoated steel sheet painted after fabrication, by Western Metal Lath, Amico West or Cemco.

    a. On solid surfaces use self-furred lath.

B. Metal trim members:

1. Minimum 26-gage hot-dip galvanized steel, supplied in longest obtainable single lengths to minimize joints, by Clark Western, Stockton Products, Amico, Cemco, Keene/Metalex Corp., Superior, Unimast Inc., or Niles Building Products, unless otherwise specified or indicated.
2. Control joints expansion flange: Clark Western No. XJ15-3.
3. Strip reinforcement: Galvanized 4-inch wide StripEX.
4. Casing bead expansion flange: Clark Western No. 66.
5. Corner reinforcement: Stockton Products Co. Corneraid, or Clark Western “Stucco-Lok”.
6. Soffit screed: Stockton Products “NFD.”

7. Base screed: Clark Western “No. 36”, Stockton Products “Stucco Stop” or “W-S” where indicated.
8. Soffit vent screed: Stockton Products “F Vent Mold,” Stockton “Type PCS.”.
9. Door and window flashing: Stockton Products WTP.

C. Screws: “Fastenseal” self-sealing screws conforming to ASTM F 1667, with a 0.125-inch diameter shank, a 7/16-inch diameter head, length to satisfy Code but not less than required to penetrate stud a minimum of 3 full threads, with an HDPE spacer containing butyl rubber, by Fasten Seal (www fastenseal.com) – no known equal.
D. Tie-wire: Galvanized, annealed steel wire 16-gage for lath-to-supports and 18 gage for accessories-to-lath.

2.2 PLASTER MIXES

A. Scratch coat (by volume): One part Portland cement, maximum one part dry hydrated lime, maximum 4 parts loose sand aggregate of the total volume of cement/lime, and 1 lb. of glass fibers or 0.7 lb. of polypropylene fibers.
B. Brown coat (by volume): Same as specified for scratch coat except that sand may be increased to 4-1/2 parts of the total volume of cement/lime.
C. Finish coat: As specified above.
D. Mixing: Mix ingredients in a plaster mixer as accurately as possible to obtain a homogenous mass. Add to the mixer from calibrated containers. Do not use materials which are caked, lumpy, dirty or contaminated by foreign materials.

1. If calibrated container supply interferes with progress of Work, shovels may be used provided they are measured to determine the accuracy of the volume of aggregate they carry, in accordance with manufacturer's printed instructions.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION/PROTECTION

A. Verify conditions and measurements affecting the work of this Section at site. Make sure that detrimental conditions are corrected before proceeding with installation.
B. Before enclosing stud walls, thoroughly clean floor tracks of debris.
C. Before plastering begins, protect adjacent finish work with waterproof covers securely taped in place.

3.2 GENERAL

A. The applicable provisions of ASTM C 1063 and C 926 govern the work of this Section, except as specified herein.

3.3 WEATHERBARRIER

A. Install weather barrier over the ~~vertical framing members~~ Air and Water Barrier specified in Section 07 27 26 with a minimum of fasteners.
B. Do not install weather barrier on horizontal framing.
C. Lap shingle fashion 2 in. at horizontal joints and 6 in. at vertical joints. No weather barrier is required on soffits. Stagger vertical joints.
D. Continue weatherbarrier uninterrupted behind control joints.
E. Lap over flange of accessories to prevent direct contact between lath and accessories and to ensure water tightness.

F. Interface weatherbarrier with flashing materials to properly discharge water to the exterior. Any absence of flashing must be corrected prior to installing any weather barrier paper.

3.4 LATHING

A. Comply with ASTM C 1063, except as specified below, and where Code requirements are more stringent.
B. Apply lath taut with long dimension at right angle to supports.
C. Apply first course at bottom and work up.

1. Stagger vertical joints. Lap end joints 1 in. minimum and horizontal joints 1/2 in. minimum.
2. Wire tie intermediate horizontal joints at 9 in. o.c. maximum.

D. Attach lath to metal supports, thru weather barrier and air and water barrier, where applicable, at 6 in. o.c.
E. Cut lath at control joints.
F. Hold lath 1/4 in. clear of electrical boxes, columns and similar items projecting through the plaster.

3.5 PLASTER ACCESSORIES

A. Wire tie at no more than 24 in. o.c. to metal lath or studs.
B. Use single length wherever length of run does not exceed longest standard stock length available. Miter or cope at corners with hairline joints, and seal with sealant specified in Section 07 92 00.
C. Set accessories level, plumb and true to line with a tolerance of not more than 1/8 in. in 5 ft. Shim as required and align joints with concealed splice or tie plates.
D. Install corner reinforcement at external corners.
E. At plaster terminations, provide casing beads at the following locations:

1. Where plaster termination abuts other finishes, isolate casing bead from contact with adjacent finishes with 1/4 in. thick tape sealant specified in Section 07 92 00.
2. Where plaster termination is not covered by another finish or applied trim, provide cased opening by installing casing bead around perimeter of opening as detailed.

F. Control joints: Install plumb, level and in one piece at the spacing indicated. Follow manufacturer's directions for their installation.

3.6 PLASTERING

A. Plaster types:

1. 3-coat work on metal lath on Air and Water Barrier/gypsum sheathing. Minimum thickness 7/8 in.
2. 3-coat work on metal lath on open framing (soffits). Minimum thickness 7/8 in.
3. 3-coat work on metal lath on Air and Water Barrier/CMU. Minimum thickness 7/8 inch.

B. Sequencing: Provide sufficient manpower and equipment to ensure a continuous operation free of cold joints, scaffold lines, texture variations, and other objectionable conditions.
C. Application: Plaster surfaces in one operation once the application of any coat has begun. Stop plaster at control joints, edges or corners only. Plaster in one operation, full height and width between control joints.

1. Scratch coat: Apply with sufficient material and pressure to form good full keys, and to cover well.

    a. Minimum thickness of scratch coat shall be 1/2 in. when measured from backing to crest of scored plaster.
    b. Scratch before plaster hardens to provide sufficient mechanical key for brown coat. Moist cure continuously for a minimum of 48 hours, including weekends and holidays.

2. Brown coat:

    a. Apply the brown coat approximately 3/8 in. thick in 2 coats. Bring to a true, even surface by rodding and floating and leave slightly rough to receive the finish coat.
    b. Begin floating only after hydration of the cement has commenced and sufficient moisture has evaporated, so that surface sheen has disappeared, but before plaster has become too rigid to be moved under the float.
    c. Moist cure as specified for scratch coat above.

3. Finish coat: Apply not less than 7 days after brown coat has been applied. Dampen brown coat thoroughly and apply finish coat to a minimum thickness of 1/8 in. to match approved sample panel.
4. Concealed plaster:

    a. Where plaster will be concealed above suspended ceilings and similar locations, the finish coat may be omitted; where concealed behind cabinets and similar furnishings and equipment, the finish coat is required.
    b. Where the assembly is fire-rated, the plaster thickness, regardless of whether a finish coat is applied or not shall meet Building Code requirements for thickness.

5. Allowable tolerances: Maximum deviation from true planes of finish plaster shall not exceed 1/8 in. in 5 ft. when measured with a straightedge placed at any point on plaster surfaces.

D. Do not use materials which are caked, lumpy, dirty or contaminated by foreign materials.
E. Plaster flush with metal frames and other built-in metal items or accessories which act as plaster grounds.
F. Where permanent grounds are too far apart to serve as guides for rodding, provide supplemental plaster screeds as required. Establish true surfaces with rods before setting the screeds. Keep grounds clean and free of plaster. Finish plaster in a true, plumb or level plane flush with grounds.

3.7 FIELD QUALITY CONTROL

A. The specified moist curing periods shall be considered as minimum requirements. Be responsible for determining the most effective procedure for curing and time lapse between application of coats, based on climatic and job conditions.
B. Completed plaster shall match approved mockups, be within the tolerance specified, be uniform in thickness, texture and color when applicable, free of cracks, blisters, pits, checks and other defects.
C. Repair, or remove and replace, as determined by the Architect, lath/plaster that does not meet these requirements, with materials satisfactory to the Architect, at no cost to the Owner.

3.8 REPAIRING/CLEANING

A. Cut, patch, repair and point-up defective plaster. Repair cracks and indented surfaces by moistening plaster and filling with new material, troweled and tamped to match adjoining surfaces. Point-up finish plaster surfaces around items which are built into or penetrate plaster.
B. Promptly remove plaster spatter and droppings from adjacent surfaces. Repair surfaces which have been stained, marred or otherwise damaged during plastering.

END OF SECTION

SECTION 09 90 00 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Painting and finishing all interior and exterior exposed surfaces throughout the Project, except as excluded in Paragraphs B and C below.
2. Surface preparation, priming and coats of paint specified herein are in addition to shop priming and surface treatment specified in other Sections.
3. Paint all exposed surfaces whether or not colors are designated, except where the natural finish of the material is obviously intended or specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.

    a. Paint surfaces, ductwork and conduit above the planetarium dome.

4. This Section also includes sealing joints between surfaces to be painted, except for joints designed to be expressed in the Work and joints between a natural finish and a painted surface.

B. Painting specified elsewhere:

1. Shop priming of ferrous metal items included under miscellaneous metal fabrications, hollow metal work, and similar work.
2. Finished (not primed) mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, except as specified in Article 3.4 below.
3. Prefinished glazed assemblies, including skylights.
4. Signage.
5. Piping identification.

C. Painting not included: Do not paint the following surfaces.

1. Roofing.
2. Steel decking.
3. Finish hardware, except those items noted USP.
4. Flexible door and window seals and weatherstripping (paint exposed metal to match door frame).
5. Finished metal surfaces such as anodized aluminum, stainless steel, chromium-plating, copper, bronze, brass and similar finished materials will not require finish painting.
6. Painting is not required on walls or ceilings in concealed and inaccessible areas, such as furred areas, pipe spaces, duct shafts and elevator shafts.
7. Operating parts, labels and nameplates:

    a. Do not paint moving parts of operating units, mechanical and electrical parts, such as valve and damper operator linkages, sinkages, sensing devices, motor and fan shafts.
    b. Do not paint over any nameplates, Code required labels, such as UL and FM, or any equipment identification, performance rating, name, or nomenclature plates.

1.2 DEFINITIONS

A. Paint: The term, as used in this Section, means all coating system components, including primers, emulsions, enamels, varnishes, stains, lacquers, sealers, fillers, and other applied materials whether used as prime, intermediate or finish coat.
B. Definitions of painting terms: ASTM D 16, unless otherwise specified.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Phasing: Program cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

1.4 SUBMITTALS

A. Materials: Copies of a complete materials list, identified by manufacturer name and product label or stock number.
B. Color samples:

1. Eight-and-one-half- by 11-inch samples of each color for painted finishes.
2. Provide stepped samples, defining each separate coat, including block fillers and primers. Identify paint system on back of control Samples.
3. Resubmit until required sheen, color, and texture are achieved.

Data: Submit for paint products, including paint label analysis, application instruction, and VOC content in grams/liter.

1.5 QUALITY ASSURANCE

A. Painter’s qualifications: Firm and individuals experienced in applying paints and coatings similar in material, design, and extent to those specified for the Project, whose work has resulted in applications with a record of successful in-service performance.
B. SCAQMD Rule 1113: Submit paint manufacturer's certificate stating that provided coatings meet or exceed current SCAQMD Rule 1113 requirements.
C. Mockups:

1. Apply sample paint finishes (approximately 10-foot square) of each color scheme to wall areas, as directed by the Architect. Refer to Section 09 24 00 for painting cement plaster mockup and to Section 09 29 00 for painting gypsum board mockup.
2. Obtain Architect's approval of mockups before proceeding further. Approved mockups will be used as a standard for the Project, and if properly identified may remain a part of the Work.
3. Final acceptance of colors will be from job-applied samples.

1.6 JOB CONDITIONS

A. Environmental requirements: Comply with paint manufacturer’s recommendations for environmental conditions.

B. Protection:

1. Protect adjacent whether being painted or not against damage from painting operation. Correct damage by cleaning, repairing, replacing, and repainting, as approved by Architect, and leave in an undamaged condition.

C. Illuminate work area during painting to provide the same or greater level of illumination required to properly perform the work and will occur in the room or space after the building is in operation.

1.7 HANDLING

A. Store materials indoors and mix only in spaces suitable for such purpose. Protect adjacent surfaces when mixing.
B. Store paint containers so the manufacturer's labels are clearly visible.

1.8 WARRANTY

A. Color of exterior surfaces painted, as part of the work of this Section shall, at the end of one year, have remained free from serious fading when compared to a control sample of the original paint.
B. Interior and exterior paint shall have its original adherence at the end of one year and there shall be no evidence of blisters, running, peeling, scaling, chalking, streaks, or stains at the end of this period.
C. Washing painted surfaces with alkali-free soap and water shall remove surface dirt from painted surfaces without producing deteriorating effects.

1.9 MAINTENANCE MATERIAL

A. With closeout submittals deliver one identified unopened gallon of each type and color of paint material used on the Project to the Owner for future paint touchup.
B. In addition to manufacturer label, identify with room number, floor or area, type of paint, color and sheen, as applicable, for future identification.

PART 2 - PRODUCTS

2.1 PAINT

A. General: Provide coating systems meeting or exceeding current SCAQMD Rule 1113 requirements.
B. Quality and manufacture: Insofar as practicable, each paint shall be factory-mixed to match approved samples and colors, and be of a consistency permitting immediate application. Use best quality grade regularly manufactured by one of the manufacturers listed in the schedule at the end of the Section.
C. Paint uniformity and compatibility: Provide finish coats compatible with the prime coats used.

2.2 MISCELLANEOUS MATERIALS

A. Joint sealant: Paintable sealant as specified in Section 07 92 00.

B. Galvanized etching product: One of the following.

1. Jasco Prep N Prime.
2. Oakite 747 LTS.
3. Henkel Galvaprep 5.

2.3 COLOR SCHEDULE

A. Refer to the Finish and Materials Schedule for paint colors.
B. The Architect will prepare a color schedule with samples for guidance in painting.
C. The Architect may select, allocate, and vary colors and sheens on different surfaces throughout the Work.
D. Number of colors to be used will be determined by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be painted for conditions that would adversely affect the permanence and quality of this work.
B. Correct unsuitable conditions before proceeding with painting.

3.2 SURFACE PREPARATION

A. General: Prepare surfaces to receive the specified finishes in compliance with the paint manufacturer’s instructions. Extend painting on all surfaces visible from any angle.
B. Hardware:

1. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in place and not to be painted, or provide surface- applied protection prior to surface preparation and painting.
2. Coat cutouts for hinges, edges of lockset holes and same as for first coat.
3. Following completion of painting each space or area, reinstall the removed item by workmen skilled in the trades involved.

C. Fire extinguishers and fire hose cabinets: Apply 2 coats of paint finish, inside and out, matching finish and color of adjoining areas, unless otherwise noted for directed.
D. Weatherstripping and sound seals. Paint exposed metal surfaces to match the door frame, whether or not unfinished, furnished with factory prime coat, or factory treated for paint adhesion.
E. Access doors and panels: Generally, paint color as surrounding walls and ceiling.

3.3 APPLICATION

A. General:

1. Seal interior joints between wood or wood composite materials, trim, baseboard, molding, and casements and adjacent materials with paintable sealant specified in Section 07 92 00.
2. Apply a clear sealer on the exterior surfaces where indicated on drawings.

3. On prefinished wood doors, finish bottom after trimming and cutouts with 2 coats of high solids clear urethane varnish promptly upon delivery to the jobsite.
4. Where the 2 faces of doors differ in color or finish, finish the edges to match the face visible when the door is open.
5. Apply paint only under conditions that will insure finishes free from blemishes and defects. Leave corners with no undue amount of paint buildup.
6. Use a slightly different shade for each coat of paint so that it may be readily identified.
7. Primer and intermediate coats shall be unscarred and completely integral when succeeding coats are applied. Sand and dust between each coat to remove defects visible from a distance of 5 feet.
8. Give particular attention to edges, angles, flanges, and other similar areas, where insufficient film thicknesses are likely to be present, and ensure proper millage in these areas.
9. Remove paint spillage and spatters on adjacent surfaces so as not to damage the surface being cleaned.

    a. Perform patching and repairs required because of painting operations.
    b. Refinish entire panel or assembly where portion of finish has been damaged or is not acceptable to the Architect.

10. Paint interior surfaces of ducts, where visible thru registers and grilles, with a flat nonspecular black paint.
11. Unless otherwise directed by the Architect, spray-paint exposed surfaces of ceiling diffusers, air return grilles, speakers and other electrical and mechanical items, except smoke detectors and sprinkler heads, in painted ceilings to match the ceilings, whether these items are primed or factory-finished.
12. Number of coats:

    a. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried.
    b. The number of coats specified is the minimum required for complete coverage and uniformity of color.
    c. Apply additional coats when undercoats, stains, or other conditions show through the final finish until the finish is of uniform color and appearance.

13. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
14. Paint interior surfaces, which are a continuation of exterior surfaces, subject to exterior exposure (such as an out-swinging door), with the applicable exterior coating system.
15. Completely cover surfaces to be painted to provide an opaque, smooth surface film uniform in finish, color, appearance, and coverage. Painted surfaces with cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness and other imperfections are not acceptable. Cut paint in sharp lines and color breaks.
16. Completed work shall match approved samples, as determined by the Architect. Remove, refinish, or repaint work not complying with specified requirements.
17. Equipment that is at or above the bottom of the planetarium dome screen level (including but not limited to electrical conduit, electrical outlets and electrical panel covers, lighting fixtures, light battens, and all HVAC ductwork), surfaces (structural steel, metal deck) and any items that will produce dust are to be painted Matte Black or Eggshell or Satin (low-luster) Black by contractor prior to installation of Planetarium Dome in theater.

~~16.~~18. Wall surfaces should be painted eggshell Black to better resist dirt and abrasions. Semi-gloss Black and high-gloss Black are not acceptable.

B. Labeling rated (fire and smoke walls and partitions): Identify both sides of rated walls and partitions above finished and decorative ceilings (plenum) with minimum 2-inch high, bright red letters spaced at 10 feet o.c. maximum, as follows. Identification can be painted using a stencil or by using pre-printed self-adhesive labels.

1. Fire rated partitions: "FIRE PARTITION - DO NOT PENETRATE."
2. Smoke barrier partitions: "SMOKE PARTITION - DO NOT PENETRATE."

C. Painting fire suppression, plumbing, HVAC, electrical, communication, and electronic safety and security work: Paint the following and their hangers and accessories where exposed to view:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Ductwork.
5. Metal conduit.
6. Plastic conduit.
7. Tanks that do not have factory-applied final finishes.

D. Application method: Contractor's option provided applied coatings match approved samples. The Architect reserves the right to require that paint be sprayed for smoothness and uniformity.

E. Priming:

1. Prime bare metal scheduled to be painted, and not embedded in concrete and masonry, immediately upon delivery to the site.
2. Time lapse between priming and application of second coat shall be as short as possible.

F. Miscellaneous painting: Surfaces to be painted and not specifically described herein, shall be painted with a product specifically manufactured or prepared for the material and surface to be painted with a prime and 2 finish coats.

3.4 TOUCHUP/CLEANING

A. At completion of construction activities of other trades, touchup and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.5 PAINT FINISH SCHEDULE

A. Finish all surfaces in compliance with the following schedule. Catalog names and numbers refer to products by the Vista, Dunn Edwards, Monochem and Carboline except as otherwise specified.

SURFACE	Number of Coats	Vista Paint	Dunn-Edwards	
EXTERIOR SURFACES				
Ferrous Metal - (Including Doors and Frames): See Section 09 96 00 – "High-Performance Coatings" Aluminum & Galvanized Steel: See Section 09 96 00 – "High-Performance Coatings"				
Stair Tread Edges: Series 222 Deco-Tread Contrasting Colo, By Tnemec.				
Concrete: 100 percent Acrylic Flat				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop	
	2nd & 3rd Coat	2000 Duratone	EVSH10 Evershield	
Portland Cement Plaster: 100 percent Acrylic Flat				
	1st Coat	4600 Uniprime II	ESPR00 Eff-Stop	
	2nd & 3rd Coat	2000 Duratone	EVSH10 Evershield	
CMU, Concrete: Graffiti-Resistant Coating				
Painted Surfaces: Permanent (Matte Flat)	1st Coat & 2nd Coat	Monochem 6100 Clear or 6150 Pigmented Base at 4-6 MILS TDFT	Monochem 6100 Clear or 6150 Pigmented Base at 4-6 MILS TDFT	
	3rd & 4th Coat	Monochem 5600 Permashield Premium at 4-6 MILS TDFT	Monochem 5600 Permashield Premium at 4-6 MILS TDFT	
Unpainted Surfaces: Permanent (Matte Flat)	Water Repellent	Monochem Aquaseal ME12	Okon S-20 Clear Water Repellent	
	1st & 2nd Coat	Monochem 6100 Clear Base at 4-6 MILS TDFT	Monochem 6100 Clear Base at 4-6 MILS TDFT	
	3rd & 4th Coat	Monochem 5600 Clear Permashield Premium at 4-6 MILS TDFT	Monochem 5600 Clear Permashield Premium at 4-6 MILS TDFT	
Unpainted exterior surfaces where a clear elastomeric clear sealer is called for	1st & 2nd (if required)			Flexi-Clear #60 by Hy-Tech Thermal Solutions, www.hytechsales.com/prod60.html
INTERIOR SURFACES				
Wood: Low Sheen 100 percent Acrylic				
	1st Coat	4200 Terminator II	UGPR00 Ultra Grip Primer	
	2nd Coat	8200 Carefree Velva Sheen	SPMA20 Suprema Velvet Sheen	
	3rd Coat	8200 Carefree Velva Sheen	SPMA20 Suprema Velvet Sheen	
Wood: Semi-Gloss 100 percent Acrylic				

SURFACE	Number of Coats	Vista Paint	Dunn-Edwards
	1st Coat	4200 Terminator II	UGPR00 Ultra Grip Primer
	2nd & 3rd Coat	8400 Carefree Semi Gloss	SPMA50 Suprema Semi Gloss
Wood and Metal: Acrylic Dryfall – Flat			
	1st Coat	DF 12 Dryfall Flat	AQUA10 Aquafall Dry Fall
	2nd Coat	DF 12 Dryfall Flat	AQUA10 Aquafall Dry Fall
CMU, Concrete, Plaster: Flat Acrylic			
	1st Coat		
	Concrete	4600 Uniprime II	ESPR00 Eff-Stop
	Plaster	4600 Uniprime II	ESPR00 Eff-Stop
	CMU	018 Acrylic Block Filler	SBPR00 BlockFill
	2nd & 3rd Coat	8100 Carefree Flat	SPMA10 Suprema Flat
CMU, Concrete, Plaster: Eggshell Acrylic			
	1st Coat		
	Concrete	4600 Uniprime II	ESPR00 Eff-Stop
	Plaster	4600 Uniprime II	ESPR00 Eff-Stop
	CMU	018 Acrylic Block Filler	SBPR00 BlockFill
	2nd & 3rd Coat	8200 Carefree Velva Sheen	SPMA30 Suprema EG
CMU, Concrete, Plaster: Semi-Gloss Acrylic			
	1st Coat		
	Concrete	4600 Uniprime II	ESPR00 Eff-Stop
	Plaster	4600 Uniprime II	ESPR00 Eff-Stop
	CMU	018 Acrylic Block Filler	SBPR00 Blockfill
	2nd & 3rd Coat	8400 Carefree SG	SPMA50 Suprema SG
CMU, Concrete, Plaster: Gloss 100 percent Acrylic			
	1st Coat		
	Concrete	4600 Uniprime II	ESPR00 Eff-Stop
	Plaster	4600 Uniprime II	ESPR00 Eff-Stop
	CMU	018 Acrylic Block Filler	SBPR00 Blockfill
	2nd & 3rd Coat	8500 Carefree Gloss	EVSH60 Evershield GL
Gypsum Board: Flat			
	1st Coat	8100 Carefree Flat	SPMA10 Suprema Flat
	2nd Coat	8100 Carefree Flat	SPMA10 Suprema Flat
Gypsum Board: Eggshell			
	1st Coat	1100 Hi-Build PVA Primer	VNPR00 Vinylastic Primer
	2nd & 3rd Coat	8200 Carefree Velva Sheen	SPMA30 Suprema EG
Gypsum Board: Low Sheen 100 percent Acrylic			
	1st Coat	1100 Hi-Build PVA Primer	VNPR00 Vinylastic Primer
	2nd & 3rd Coat	8300 Carefree Eggshell	SPMA40 Suprema Low Sheen

SURFACE	Number of Coats	Vista Paint	Dunn-Edwards
Gypsum Board: Semi-Gloss Acrylic			
	1st Coat	1100 Hi-Build PVA Primer	VNPR00 Vinylastic Primer
	2nd & 3rd Coat	8400 Carefree Semi-Gloss	SPMA50 Suprema Semi Gloss
Gypsum Board: 100 percent Gloss Acrylic			
	1st Coat	1100 Hi-Build PVA Primer	VNPR00 Vinylastic Primer
	2nd & 3rd Coat	8500 Carefree Gloss	EVSH60 Evershield Gloss
Ferrous Metal: Semi-Gloss 100 percent Acrylic			
	1st Coat	9600 Protec Primer	BRPR00 Block-Rust
	2nd Coat	8400 Carefree SG	SPMA50 Suprema SG
	3rd Coat	8400 Carefree SG	SPMA50 Suprema SG
Ferrous Metal: Gloss 100 percent Acrylic			
	1st Coat	9600 Protec Primer	BRPR00 Block-Rust
	2nd Coat	8500 Carefree Gloss	EVSH00 Evershield GL
	3rd Coat	8500 Carefree Gloss	EVSH00 Evershield GL
Ferrous Metal (Heavy Duty): Aliphatic Urethane. Refer to Exterior Surfaces			
	1st Coat	Carboline Carboguard 890VOC at 5 MILS DFT	Carboline Carboguard 890VOC at 5 MILS DFT
	2nd Coat	Carboline Carbothane 133MC at 5 MILS DFT	Carboline Carbothane 133MC at 5 MILS DFT
	OR	For shop-primed, omit first coat	For shop-primed, omit first coat
Aluminum: Semi-Gloss 100 percent Acrylic			
	1st Coat	9600 Protec Primer	BRPR00 Block-Rust
	2nd Coat	8400 Carefree SG	SPMA50 Suprema SG
	3rd Coat	8400 Carefree SG	SPMA50 Suprema SG
Aluminum: Gloss 100 percent Acrylic			
	1st Coat	4800 Metal Pro Primer	UGPR00 Ultra Grip
	2nd Coat	8500 Carefree Gloss	EVSH00 Evershield GL
	3rd Coat	8500 Carefree Gloss	EVSH00 Evershield GL

Intumescent Paint on Plywood Backing Panel: Apply one or more coat (as recommended by the paint manufacturer, of latex paint “Intumescent Latex” (thin film) by Contego International, “Flame Stop IM” by Flame Stop, Inc., or equal.

END OF SECTION

SECTION 11 13 00 – PLANETARIUM LIFTER ASSEMBLY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Two-stage scissors hydraulic lift assembly for the attachment of a planetarium projection system to be located in central pit of the planetarium theater.
2. Hydraulic power unit to be located outside the planetarium theater.

B. Items furnished, but not installed under this Section:

1. Furnish setting drawings, templates, instructions and directions for installation of inserts and anchorage devices. Refer to Division 03 for installation of these items.
2. Furnish inserts and anchoring devices to be set in concrete.

C. Items installed, but not furnished under this Section: Custom Table Top.

D. Related requirements:

1. Division 05 for guardrails.
2. Division 26 for electrical connections.

1.2 SYSTEM DESCRIPTION

A. Two-stage scissors lift with a custom table top for the attachment of a planetarium projection system with the power unit for the lifter located outside the planetarium theater, separating power unit and lifter up to 40 feet.

1.3 SUBMITTALS

A. Data: Manufacturer Product Data, including rated capacity, furnished specialties, accessories, details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings:

1. Supplement data with Shop Drawings showing specific Project conditions, plans, elevations, and large scale details of the assembly.
2. Show anchorages to supporting construction. Provide templates for anchors and bolts anchored to permanent construction.
3. Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
4. Show final slot and hole locations of table top provided by the planetarium manufacturer.

C. Samples: Assembly manufacturer’s color chips showing proposed texture, color and sheen for exposed surfaces. Approved samples will serve as Architect’s control samples.

D. Closeout:

1. Copies of manufacturer service and maintenance data, including name, address and telephone number of nearest authorized service representative.

2. Operating Manuals: Furnish operating and maintenance manuals and advise Owner on use and maintenance of equipment.

E. Warranty: Copies of manufacturer's warranties.

1.4 QUALITY ASSURANCE

A. Lifter: Assembly shall comply with applicable requirements of ANSI, MH29.1, ("Safety Standard for Industrial Scissor Lifts") for construction and operation of lifter.
B. Electrical: All electrical components and the entire controller assembly shall be UL listed.
C. Installer's qualifications: Experienced authorized representative of lifter manufacturer for both installation and maintenance, with facilities located no more than 2 hours' normal travel time from Project site.
D. Controls: Lifter manufacturer shall assist planetarium provider in engineering secondary on-up/down/off lifter controls at planetarium control console.

1.5 SPECIAL WARRANTIES

A. Submit a written warranty, executed by the lifter manufacturer, agreeing to repair or replace lifter components that fail in materials or workmanship within the specified warranty period at no cost to the Owner.
B. Failures include, but are not limited to, the following:

1. Structural failures, including cracked or broken structural support members and load-bearing welds.
2. Deck plate failures, including cracked plate or permanent deformation in excess of 1/4-inch between deck supports.
3. Hydraulic system failures, including failure of hydraulic seals and cylinders.
4. Faulty operation of operators, control system, or hardware.

C. Warranty periods:

1. Structural Assembly: 10 years from date of Substantial Completion, or 250,000 cycles, whichever comes sooner.
2. Hydraulic Assembly: 2 years from date of Substantial Completion.
3. Warranty shall be for unlimited usage of the assembly for the specified rated capacity over the term of the warranty.

1.6 MAINTENANCE SERVICE

A. Initial maintenance service:

1. Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of dock equipment installer.
2. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper equipment operation at rated speed and capacity.
3. Provide parts and supplies as used in the manufacture and installation of original equipment.
4. Perform maintenance, including emergency callback service, during normal working hours.
5. Include 24/7 emergency callback service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Advance Lifts, Inc. (basis of design.)
B. Or equal.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Rigidity: The scissor leg assembly shall be of structural tube construction for maximum rigidity.
B. Capacity:

1. 2,000 lbs max. Lifting.
2. 2,000 lbs max. Capacity ends. Lagged down unit.
3. 1,400 lbs max. Capacity sides. Lagged down unit.

2.3 PLANETARIUM LIFTER ASSEMBLY

A. Design is based on Advance Lifts Model MS12-84 to accommodate custom table top furnished by the selected planetarium manufacturer.

1. Base platform:

a. Size: 38 inches wide by 60 inches long smooth steel table top with slots and hole offset from main deck
b. Speed: 27 seconds (up.)
c. Travel: 84 inches from a 12.5-inch lowered height.
d. Maximum height off-of-floor: 96.5 inches.
e. Lowered height: 12.5 inches off-of-floor.

2. Axles and Shafts: Chrome plated.
3. Rollers and pivot points: Equipped with Teflon self-lubricating bearings.
4. Power Unit: Equipped with valve manifold.
5. Lubricant: Manufacturer shall provide 10 gallons of a multi viscosity ISO-46 group II base oil for the lift hydraulic system.
6. Miscellaneous materials and accessories:

a. Four leveling bolts to adjust height at ± 0.50 inch.
b. Two shock absorbers.
c. One upper travel limit switch.
d. One lower travel limit switch.
e. One 84-inch long power cord.
f. One 40-foot max long pushbutton cord.
g. One 40-foot max LG hydraulic hose for power unit to lift connection.
h. One 40-foot max LG electrical wiring for upper & lower travel limit switches.
i. Interconnecting wiring (pre-wired to furnished plug.)

B. Remote power unit: 2 hp motor 230v 60 hz 3 ph high pressure pump, hydraulic valve manifold, reservoir and electrical controller, remote from lift.
C. Electrical (pushbutton) controls: Constant pressure UP and Down pushbutton. NEMA 12 UL listed control box with magnetic motor starter with 3 pole adjustable overloads, 24 Volt 4

amp fused secondary control transformer and the entire control box assembly, not just components, labeled as UL listed.

D. Factory-applied paint: Lifter manufacturer's standard matte black baked-on enamel, matching Architect's control sample for texture, color and sheen.

PART 3 - EXECUTION

3.1 EXAMINATION/PREPARATION

A. Examine conditions and measurements affecting the work of this Section at site.
B. Verify that concrete support dimensions and tolerances conform to the requirements of the lifter manufacturer.
C. Correct detrimental conditions before proceeding with installation.

3.2 INSTALLATION

A. Install assembly in compliance with manufacturer instructions, plumb, level, and secure.
B. Anchor securely to supports.
C. Tolerances:

1. Horizontal accuracy: Repeatable position with error less than ± 1mm.
2. Vertical accuracy: Repeatable position with error less than ± 4mm.

3.3 ADJUSTING

A. Adjust assembly for safe, efficient operation.
B. Test for vertical travel when loaded within operating range indicated.

3.4 CLEANING AND PROTECTING

A. Restore marred, abraded surfaces to their original condition using same paints used for shop-finishing.
B. Provide final protection and maintain assembly in a manner acceptable to manufacturer and installer so that the assembly is without damage or deterioration at Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below.

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
3. Review data in maintenance manuals.
4. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

END OF SECTION

SECTION 11 52 13 - PROJECTION DOME SCREEN INSTALLATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Installing Owner-furnished Planetarium Projection Screen.
2. Furnishing, installing and finishing the screen assembly.

B. Related requirements: Division 01 for alternates.

1.2 QUALITY ASSURANCE

A. Employ Astro-Tec authorized/factory-trained personnel to conduct the dome assembly and dome painting.

1.3 COORDINATION

A. Coordinate dome installation with other trades who will be mounting conduits and receptacles to the back-side of the dome structure.

PART 2 - PRODUCTS

2.1 PROJECTION SCREEN

A. Owner-furnished 41-foot diameter Hyperdome Planetarium Projection Screen by Astro-Tec Manufacturing, 550 Elm Ridge Avenue, Canal Fulton, Ohio, complete with installation and finishing materials, and accessories required for a complete installation.
B. Seam material: Screen manufacturer’s patented material.
C. Paint: Proprietary water-based, as recommended by the screen manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.
B. Correct detrimental conditions before proceeding with installation.

3.2 INSTALLATION

A. General: Install the screen in compliance with its manufacturer’s instructions.

B. Seaming process:

1. Standard seam construction: Seams where the panels join, shall be overlapped by no more than 29mm and shall have a Patented opaque flat black material of minimum thickness between the layers. Secure panels to the ribs using low profile aluminum rivets. Do not locate vertical and horizontal seams where there are no structural elements available for support.
2. Custom Alternate “Ulteria Seam” construction: As specified for standard seam construction, but using a crimped edge method on both the vertical and horizontal axes, so that all light-reflective surfaces are flush with one row of rivets producing a smooth and nearly seamless projection surface.

END OF SECTION

SECTION 12 61 00 – FIXED PLANETARIUM SEATING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fixed, floor-mounted planetarium seating.

1.2 SUBMITTALS

A. Manufacturer product data, installation instructions and general recommendations for seating.
B. Samples:

1. Full yard sample of selected fabric.
2. Seating manufacturer's standard size samples for each type of exposed material.
3. One typical full size sample of seating.
4. Approved samples will serve as Architect's control samples.

C. Shop drawings: Dimensioned shop drawings showing seating layout, anchorage to supports and other details required for installation.

1. Show all chairs, sizes and aisle widths.

D. Test data: Submit certified copies of test reports by a recognized independent test laboratory, establishing conformance to the performance tests.
E. Maintenance materials:

1. With closeout submittals, provide the Owner with the following:

a. Production overrun of spare seats, backs, armrests and standards of each type used in installation.
b. Fabricated covers of each type equivalent to 5 percent of covers installed on the Project, but not less than 3, from same material of each weave, texture and color used on the Project.

1.3 QUALITY ASSURANCE

A. Installer qualifications: Manufacturer-approved, locally-based, experienced installer who regularly installs and services planetarium seating similar in kind, quality, and extent to that indicated for Project.
B. Fire performance characteristics of upholstered seating: Provide assemblies complying with the following.

1. Chairs complying with BIFMA F-1, sponsored by the Business and Institutional Furniture Manufacturer's Association, based on testing of chairs representative of those required for Project, and certified accordingly.
2. Finished chairs comply with State of California, Department of Consumer Affairs, Bureau of Home Furnishings and Thermal Insulation, Technical Bulletins 133, 116 and 117.

C. Single source responsibility: Obtain planetarium seating from a single manufacturer, including accessories, and mounting and other installation components.

D. Seating layout: Design and install seating to conform with Project requirements to produce seating layout with standards spaced laterally in each row so that end standards are in alignment from first to last row, regardless of whether aisles converge or are of constant width, and with backs and seats varied in width so that sightlines are optimized.

E. Field-constructed mockup:

1. Prior to installation of seating, erect mockup consisting of 2 chairs representing extremes of width to be provided; include at least one aisle unit.
2. Locate mockup on site in location directed by Architect.
3. Obtain Architect's acceptance of mockup before beginning production of seating for Project.
4. Retain and maintain mockup during construction in undisturbed condition as a standard for judging completed seating.
5. Accepted mockups in undisturbed condition at time of Substantial Completion may become part of the completed seating installation.

F. Coordination: Coordinate installation of electrical wiring with seating layout to ensure that floor junction boxes for aisle lights are located inboard of aisle light standards to result in minimal exposure of conduit.

1.4 HANDLING

A. Packing: Pack chairs by like kinds of parts (i.e. pedestals, beams, standards, backs, seats, arms, etc.), in clearly marked cartons.

B. Delivery: Deliver seating at proper time for installation, not interfering with other trades operating in the building.

C. Storage: Store at the site in a protected location to avoid damage.

1.5 PROJECT CONDITIONS

A. Do not install seating until space is enclosed and weatherproof, wet-work in space is complete and nominally dry, installation of finishes including painting is complete, other work above ceiling are complete; and ambient temperature and humidity conditions will be continuously maintained at values near those indicated for final occupancy.

1.6 SPECIAL WARRANTIES

A. Seating manufacturer's warranty covering materials and workmanship for 5 years from the date of Substantial Completion.

B. Seating manufacturer’s warranty covering the gravity lift seat return for the lifetime from the date of Substantial Completion.

C. Repair or replace parts that become defective during the warranty period at no cost to the Owner,

PART 2 - PRODUCTS

2.1 MANUFACTURERS/TYPE

A. Manufacturer: Seating Concepts, LLC, San Diego, California.

B. Type: “Entertainer (Planetarium)”, floor-mounted units with Planetarium Back wings (fixed back pitch,) including the following:

1. Self-lifting seats, automatically raising to a uniform 3/4 fold position.

2. Upholstery Fabric: Marquesa lana “Sherpa & Shire,”
3. Decorative back stitch (Envoy Stitch #95) with vinyl headrest area.
4. Rounded injection-molded textured plastic outerback – 41 inches overall height.
5. Contour back foam with lumbar support and contour seat foam.
6. Injection molded textured seat pan with steel counterbalance.
7. Trapezoid full length end aisle standards – insert panels surfaced with seating concepts stock laminate with metal edge banding.
8. Hardwood mahogany, maple or oak rectangular or radius design seating concepts armrests with stained & lacquered or seating concepts stock laminate surface or injection molded armrest (available in black only.)
9. Oversized tablet arms, laminated on one side only.
10. Seating manufacturer’s standard floor expansion bolts and assembly hardware and miscellaneous parts and accessories required for complete installations.

2.2 PERFORMANCE REQUIREMENTS

A. Seating shall be designed and manufactured in compliance with the intent of ANSI/BIFMA X5.4-1990. Seating shall exceed all applicable BIFMA performance test criteria.

2.3 ACCESSIBLE SEATING

A. Provide chairs with retractable or fold-up arm on aisle side in locations indicated, but not less than 5 percent of aisle seats. Identify these seats with a sign or marker in compliance with CBC 11B-802.4.

2.4 MATERIALS

A. Steel: All steel shall have smooth surfaces and be of sufficient gage thickness and designed to withstand strains of normal use and abuse.

B. Padding Material: Cold molded polyurethane foam, complying with the flammability requirements outlined in California Technical Information Bulletin #117, Resilient Cellular Materials, Section A & D, dated March 2002, when tested in accordance with Federal Test Method Standard 191, Method 5903.2.

C. Wood, general: Plywood, exposed or concealed, shall be hard wood. All plywood shall be hot press laminated using high frequency process. Interior plies shall be Class 3 or better. Exposed exterior plies shall be Class 1. Particle core shall be 55-pound density.

D. Plastic: Injection molded, high-density polypropylene with ultra violet light inhibitors to retard fading, with a burn rate of one inch per minute when tested in accordance with ASTM D635 or the Department of Transportation of Motor Vehicle Safety Standard No. 302.

E. Plastic laminate: Core of kraft papers impregnated with phenolic resins, a decorative surface sheet, and overlay sheet containing melamine, with layers fused together under pressures in excess of 1000 PSI, and temperatures over 275 degrees, and meeting or exceeding performance standard as established by N.E.M.A.

1. Thickness: Horizontal Surfaces: 0.050 inch.
2. Vertical Surfaces: 0.030 inch.

2.5 FINISHES

A. Metal: Prior to the application of epoxy powder finish, all metal parts shall be cleaned by use of a three step process consisting of an iron phosphate, hot water rinse and a chromic acid rinse. All metal parts, both exposed and non-exposed, shall be coated with an epoxy powder, which shall be electrostatically applied. All metal shall have a Minimum Dry Film Thickness of at least two millimeters and shall pass the 2H hardness test. All coated metal

parts shall be baked-on at not less than 360 degrees. Match Architect's control sample for color and sheen.

B. Wood, general: Stain exposed surfaces to color selected and with baked-on lacquer of sufficient film depth to afford wear resistance of institutional quality. Match Architect's control sample for color and sheen.

C. Plastic: As selected from manufacturers standard color range. Match Architect's control sample for color, texture and sheen.

D. Hardware: All assembly hardware shall be rust resistant, black plated.

E. Fabric and color: As specified above.

2.6 FABRICATION, GENERAL

A. Fabricate planetarium seating units in contoured form using materials free of defects, objectionable projections, or irregularities. Smoothly round corners, edges, and exposed fasteners, to present least possible snagging and pinching hazards.

B. Fabricate chair backs of seating rows located immediately in front of cross aisles on sloped or tiered floors so that back heights are not less than dimension indicated below, measured from walking surface of cross aisle immediately behind seating.

C. Ferrous metal finishes: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

2.7 CHAIR STANDARDS

A. Pedestal design made with a rectangular tube with 18 gage steel 1 by 3 inches. The tube shall be attached by a concealed weld to a 3-1/4- by 8-inch, 14 gage deep formed steel foot. The foot shall have 4 holes for attachment of the standard to a concrete floor with lead shielded expansion bolts. 2 bolts shall be used for attachment of the fixed chair or lounger chair and 4 screws shall be used to attach to a wood floor surface (see wood floor surface thickness requirements). A reinforced 1/4-inch steel bracket for seat pan attachment shall be integrated into the standard which has an inlay at mid point for resistance upon force. The seat pan shall be anchored to the standard by use of a hexagon 5/16-inch fusion nut and a hexagon bolt of 5/16- by 3/4-inch through a threaded insert on the steel seat bracket. A lug support for attachment of the back shall be made of 14 gage sheet metal. Welded to the top of the column shall be a 11 gage plate for armrest attachment.

2.8 AISLE STANDARDS

A. Oval, fabricated in the same manner as the center standards with a required formed frame of 18 gage steel welded to the column to accept a decorator panel finished with laminated plastic, upholstery or with the specified finish. Furnish end panels pursuant to the plan of seating.

2.9 RISER STANDARDS

A. Riser mounted standards shall take into account the curvature of the riser. The standards shall be a rectangular tube, one inch by 3 inches with a break to ensure that the seat height is 17-1/2 inches from the floor. A 4-inch square steel plate shall be continuously welded to the tube for attachment to the riser. The riser height must be at least 8 inches high and 90 degrees, plus or minus 1/8 inch. 4 expansion bolts are required to attach the standard to the surface.

2.10 SEAT CUSHION AND SEAT PAN WITH HINGE

A. Seat cushion shall be of arch-spring type. The seat cushion frame shall be of one piece reinforced injection molded polypropylene. Serpentine springs of normalized steel of 10

gage, painted in epoxy paint to prevent corrosion, shall span the frame and be secured to the injection molded frame so as to eliminate noise. The spring assembly shall be covered by a tough and durable inter-liner to provide a chafing barrier to protect the cold molded polyurethane seat cushion. The seat cushion shall be cold molded to the contour of the springs to provide raised outer edge so that the overall seat foam is contoured for exceptional body support in the hip area. The foam shall have a density of 3.4 +/- point two. The seat frame shall have two steel bars that span the width of the cushion and which provide additional strength and support. The seat frame shall rotate on one 14 gage 7/8-inch diameter cold rolled steel hinge rod securely attached to the seat frame. The additional hollow steel tube is attached to the rear of the frame for additional strength, support and stability. The steel flanges for attachment to the standards are made of 7 gage steel. Stops that limit rotation are stamped-died from 9 gage steel and are filled wit high impact resistance neoprene rubber. High resistant nylon bushings are used at the pivot points to prevent metal to metal contact. The specified fabric, carefully tailored, shall be of panel side construction and manufactured as a slip cover with a draw string application. The slip cover fits over the entire assembly in order to allow ease in replacement.

B. The self-lifting mechanism shall be a counter balance system integrated within the seat frame and which utilizes a weight inserted into the interior of the seat frame which allows the seat pan to return to a 75 or 90 degree vertical position by means of gravity. There shall be two ½" square tube stops, two counter-stops and two 1" cold rolled steel bushings, all reinforced.

C. The seat frame and return mechanism shall be enclosed with an Injection molded polypropylene cover with a decorative embossment or wood veneer/laminate surfaced over ply wood cover and attaches to the frame without screws or other fasteners but which can be removed with the use of a specially supplied tool. The rear of the seat pan shall be vented to allow the foam to breathe.

2.11 "ENTERTAINER" MULTIPLE CHAIR BACK

A. Chair back shall be padded with a cold molded polyurethane foam of 2-inches thickness at the top increasing to 3 inches at the bottom of the back and designed for lumbar support. The foam shall be cemented to an injection mold base with four 1/4-inch threaded inserts for the attachment of two die formed metal supports (back wings), 14 gage, with 4 cold-rolled galvanized flat head steel screws 1/4-inch by 3/4-inch. This shall be mounted onto a high impact, injection molded polypropylene outer back.

B. All attachment screws shall be fully concealed. Back wings shall have provision for 20, 25, 30, 35, 40, and 45-degree pitch. Overall height of the chair from floor to top of the back varies between 39-1/4 inch to 41-1/2 inch (depending on back inclination); 41 inches in the standard 25-degree back pitch.

2.12 ARMRESTS

A. Solid hardwood, stained to finish approved by the Architect, designed to have a perfect fit with the standards of the chair, which have an exuberance in the lower section, perfectly distributed to hold four lag screws of cold rolled galvanized steel 1/8 inch by19/32 inch. The armrest for the center standards shall be substantially similar in size to the aisle standard armrests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct detrimental conditions before proceeding with installation.

3.2 INSTALLATION

A. Mark seating layout on slab. Verify spacing and alignment and obtain Architect's approval of the layout.
B. Install seating in compliance with manufacturer instructions and the approved Shop Drawings, plumb, level and securely anchored.

1. Install standards with each standard attached to substrate by not less than 2 anchoring devices of size and type required to result in installations free from rocking and instability under actual use.
2. Use installation methods and fasteners accepted in mockup and that produce fixed audience seating assemblies with individual chairs capable of supporting an evenly distributed 600-lb static load without failure or other conditions that might impair the chair's usefulness.

C. Install chairs by mounting components to standards or brackets mounted on standards, using manufacturer recommended hardware and fasteners.
D. Verify that moving components operate smoothly and quietly.

3.3 ADA REQUIREMENTS

A. Wheelchair Areas: Integral part of any fixed seating plan, dispersed throughout the seating area. Do not limit wheelchair spacing to the rear of the planetarium; situate at the front or in other locations in compliance with the ADA requirements. Wheelchair areas shall still adjoin an accessible route that also serves as a means of egress in case of an emergency and shall still be located in an area that provides lines of sight comparable to those of all other viewing areas.
B. Semi ambulant Individuals: In addition to spaces provided for wheelchair users as noted, there shall be provided seating for semi ambulant individuals. The number of such seating shall be equal to at least one percent of the total seating and shall be no fewer than two or as predicated by local or state ordinances. Such seats shall provide at least 24 inches clear leg space between the front of the seat to the nearest obstruction or to the back of the seat immediately in front.

3.4 ADJUSTING

A. Adjust self-rising seat mechanisms as required to assure that seats in each row are aligned when upright.
B. Touchup minor abrasions and imperfections in painted finishes with coating which matches factory-applied finish.
C. Replace upholstery damaged in installation.

END OF SECTION

SECTION 23 08 00 – COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Definitions, warranties, test equipment requirements, and mechanical commissioning requirements.

1.2 RELATED SECTIONS

A. Contents of Division 23, HVAC and Division 01, General Requirements apply to this Section.
B. Section 01 91 13, General Commissioning Requirements.

1.3 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
B. Meet requirements of current edition of ASHRAE Guideline 0, The Commissioning Process.

1.4 SUBMITTALS

A. Submittals as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
B. In addition, provide:

1. Certificates of readiness.
2. Certificates of completion of installation, prestart, and startup activities.
3. Operation and Maintenance Manuals.
4. Test reports.
5. Control Drawings Submittal

    a. Provide a key to abbreviations.
    b. Provide graphic schematic depictions of the systems and each component.
    c. Include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
    d. Provide a full points list with at least the following included for each point:

        1) Controlled system
        2) Point abbreviation
        3) Point description
        4) Display unit
        5) Control point or set point (Yes / No)
        6) Monitoring point (Yes / No)
        7) Intermediate point (Yes / No)
        8) Calculated point (Yes / No)

6. Architect forwards one set of submittals for systems to be commissioned to Commissioning Agent at same time as design team.
7. Commissioning Agent forwards comments to design team for consideration in their submittal response.
8. Design team sends consolidated response to submittals and copies to Commissioning Agent.

1.5 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
B. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to Commissioning Authority upon request.

1.6 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00, HVAC Basic Requirements and Division 01, General Requirements.
B. In addition, provide:
    1. Commissioning, inspecting, and testing will not modify terms or time periods of mechanical equipment, systems, and controls warranties including related equipment and systems, and adjacent work.
    2. Control system warranty period starts from date of Commissioning Agent acceptance.

1.7 COORDINATION

A. Reference Section 01 91 13, General Commissioning Requirements, for requirements pertaining to coordination during the commissioning process.

1.8 PURPOSE

A. Purpose of commissioning process is to provide Owner assurance that systems have been installed in prescribed manner and will operate within performance guidelines. Commissioning is intended to enhance quality of system startup and aid in orderly transfer of systems to beneficial use by Owner.
B. Commissioning procedures and results will be observed by Commissioning Authority or Owner's staff. Contractor is expected to verify functional readiness of systems to be tested prior to performing the tests in presence of Owner's witness. A high rate of test failure will indicate that Contractor has not adequately verified readiness of systems.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide standard testing equipment required to perform startup, initial checkout and functional performance testing for the equipment being tested. For example, the mechanical contractor of Division 23, HVAC will ultimately be responsible for standard testing equipment for the HVAC&R system and controls system in Division 23, HVAC, except for the equipment specific to and used by TAB in their commissioning responsibilities. Provide a sufficient quantity of two-way radios by each subcontractor.
B. Include special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing in the base bid price to the Owner and leave on site, except for stand-alone data logging equipment that may be used by the Commissioning Authority.

C. Manufacturer of equipment to provide proprietary test equipment and software required for programming and/or start-up, whether specified or not. Manufacturer provides the test equipment, demonstrates its use, and assists in the commissioning process as needed. Proprietary test equipment (and software) becomes the property of the Owner upon completion of the commissioning process.
D. Data logging equipment and software required to test equipment will be provided by the Commissioning Authority, and will not become the property of the Owner.
E. Use only testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers have a certified calibration within the past year to an accuracy of 0.5 degree F and a resolution of plus or minus 0.1 degree F. Pressure sensors have an accuracy of plus or minus 2.0 percent of the value range being measured (not full range of meter) and have been calibrated within the last year.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the installing contractors, the Commissioning Authority will prepare prefunctional checklists for commissioned components, equipment, and systems
B. Red-Lined Drawings:

1. Verify equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The contracted party, as defined in the Contract Documents will create the as-built drawings.

C. Operation and Maintenance Data:

1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for commissioned equipment and systems.
2. The Commissioning Authority will review the O&M literature once for conformance to project requirements.
3. The Commissioning Authority will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Demonstration and Training:

1. Contractor will provide demonstration and training as required by the specifications.
2. A complete training plan and schedule must be submitted by the contractor to the Commissioning Authority four weeks prior to any training.
3. A training agenda for each training session must be submitted to the Commissioning Authority one week prior the training session.
4. Notify the Commissioning Authority at least 72 hours in advance of scheduled tests so that testing may be observed by the Commissioning Authority and Owner's representative. Provide a copy of the test record to the Commissioning Authority, Owner, and Architect.
5. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specific equipment.

6. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.
7. Review data in O&M Manuals.

3.2 CONTRACTOR'S RESPONSIBILITIES

A. Mechanical, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23, HVAC are as follows (references apply to commissioned equipment only):

1. Perform commissioning tests at the direction of the Commissioning Authority.
2. Attend construction phase controls coordination meetings.
3. Attend testing, adjusting, and balancing review and coordination meetings.
4. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the Commissioning Authority.
5. Provide information requested by the Commissioning Authority for final commissioning documentation.
6. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or subcontract written.
7. Prepare preliminary schedule for mechanical system orientations and inspections, operation and maintenance manual submissions, training sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, testing and balancing and task completion for owner. Distribute preliminary schedule to commissioning team members.
8. Update schedule as required throughout the construction period.
9. During the startup and initial checkout process, execute the related portions of the prefunctional checklists for commissioned equipment.
10. Assist the Commissioning Authority in verification and functional performance tests.
11. Gather operation and maintenance literature on equipment, and assemble in binders as required by the specifications. Submit to Commissioning Authority 45 days after submittal acceptance.

B. Coordinate with the Commissioning Authority to provide 48 hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
C. Notify the Commissioning Authority a minimum of 2 weeks in advance of the time for start of the testing and balancing work. Attend the initial testing and balancing meeting for review of the official testing and balancing procedures.
D. Participate in, and schedule vendors and contractors to participate in the training sessions.
E. Provide written notification to the Construction Manager/General Contractor (CM/GC) and Commissioning Authority that the following work has been completed in accordance with the Contract Documents, and that the equipment, systems, and sub-system are operating as required.

1. HVAC&R equipment including fans, air handling units, ductwork, dampers, terminals, and other equipment furnished under this Division.
2. Fire stopping in the fire rated construction, including fire and smoke damper installation, caulking, gasketing and sealing of smoke barriers.
3. Fire detection and smoke detection devices furnished under other divisions of the specification.

F. Equipment supplier to document the performance of his equipment.
G. Test, Adjust and Balance Contractor:

1. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.

2. Participate in verification of the testing and balancing report, which will consist of repeating measurements contained in the testing and balancing reports. Assist in diagnostic purposes when directed.

H. Provide training of the Owner's operating staff using expert qualified personnel, as specified.

I. Equipment Suppliers:

1. Provide requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
2. Assist in equipment testing per agreements with contractors.
3. Provide information requested by Commissioning Authority regarding equipment sequence of operation and testing procedures.

J. Reference Section 01 91 13, General Commissioning Requirements for additional contractor responsibilities.

3.3 OWNER'S RESPONSIBILITIES

A. Reference Section 01 91 13, General Commissioning Requirements for Owner's Responsibilities.

3.4 DESIGN PROFESSIONAL'S RESPONSIBILITIES

A. Reference Section 01 91 13, General Commissioning Requirements for Design Professional's Responsibilities.

3.5 RESPONSIBILITIES

A. Reference Section 01 91 13, General Commissioning Requirements for Commissioning Authority's Responsibilities.

3.6 TESTING PREPARATION

A. Certify in writing to the Commissioning Authority that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify in writing to the Commissioning Authority that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify in writing that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the Commissioning Authority.

3.7 TESTING, ADJUSTING AND BALANCING VERIFICATION

A. Prior to performance of Testing, Adjusting and Balancing work, provide copies of reports, sample forms, checklists, and certificates to the Commissioning Authority.
B. Notify the Commissioning Authority at least 10 days in advance of testing and balancing Work, and provide access for the Commissioning Authority to witness testing and balancing Work.
C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the Commissioning Authority.
    1. The Commissioning Authority will notify testing and balancing subcontractor 10 days in advance of the date of field verification. Notice will not include data points to be verified.
    2. Testing and balancing subcontractor to use the same instruments (by model and serial number) that were used when original data were collected.
    3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items to result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB to result in rejection of final testing. Variations in background noise must be considered.
    4. Remedy the deficiency and notify the Commissioning Authority so verification of failed portions can be performed.

3.8 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the Commissioning Authority.
B. Scope of HVAC&R testing to include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing to include measuring capacities and effectiveness of operational and control functions.
C. Test operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
D. The Commissioning Authority along with the HVAC&R contractor, testing and balancing Subcontractor, and HVAC&R Instrumentation and Control Subcontractor to prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.
E. Tests will be performed using design conditions whenever possible.
F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the Commissioning Authority and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
G. The Commissioning Authority may direct that set points be altered when simulating conditions is not practical.
H. The Commissioning Authority may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.9 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 23, HVAC Sections. Provide submittals, test data, inspector record, and certifications to the Commissioning Authority.
B. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23, HVAC Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls." Assist the Commissioning Authority with preparation of testing plans.
C. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.
D. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of components, systems and sub-systems. Evaluate the following equipment and systems:

1. HVAC Equipment and Systems (all)
2. Building Automation System

3.10 DEFICIENCIES/NONCONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

A. Reference Division 01, General Requirements for requirements pertaining to deficiencies/nonconformance, cost of retesting, or failure due to manufacturer defect.

3.11 OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals to conform to Contract Documents requirements as stated in Division 23, HVAC.
B. Provide an updated as-built version of the control drawings and sequences of operation in the final controls O&M manual submittal.

3.12 TRAINING OF OWNER PERSONNEL

A. Mechanical Contractor's Training Responsibilities:

1. Provide the Commissioning Authority with a training plan two weeks before the planned training.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of HVAC equipment including, but not limited to, HVAC equipment (i.e. pumps, heat exchangers, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.)
3. Training starts with classroom sessions followed by hands-on training on each piece of equipment to illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative provides the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.

6. Controls contractor to attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.
7. The training sessions follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
8. Training Includes:

    a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. Training to include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discussion of relevant health and safety issues and concerns.
    d. Discussion of warranties and guarantees.
    e. Common troubleshooting problems and solutions.
    f. Explanatory information included in the O&M manuals and the location of plans and manuals in the facility.
    g. Discussion of any peculiarities of equipment installation or operation.

9. Schedule training after functional testing is complete, unless approved otherwise by the Owner.

B. Controls Contractor's Training Responsibilities:

1. Provide the Commissioning Authority and A/E with a training plan four weeks before the planned training.
2. Provide designated Owner personnel training on the control system in this facility. The intent is to clearly and completely instruct the Owner on the capabilities of the control system.
3. Training manuals. The standard operating manual for the system and any special training manuals will be provided for each trainee, with three extra copies left for the O&M manuals. In addition, copies of the system technical manual will be demonstrated during training and three copies submitted with the O&M manuals. Manuals include detailed description of the subject matter for each session. Manuals to cover control sequences and have a definitions Section that fully describes relevant words used in the manuals and in software displays. Manuals will be approved by the Commissioning Authority and A/E. Deliver copies of audiovisuals to the Owner.
4. The trainings will be tailored to the needs and skill-level of the trainees.
5. The trainers will be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) will be used. Owner to approve the instructor prior to scheduling the training.
6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
7. Attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 23 09 00 - BUILDING MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building Management System (BMS), utilizing direct digital controls.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Products Supplied But Not Installed Under This Section:

1. Control valves.
2. Flow switches.
3. Wells, sockets and other inline hardware for water sensors (temperature, pressure, flow).
4. Automatic control dampers, where not supplied with equipment.
5. Airflow measuring stations.
6. Terminal unit controllers and actuators, when installed by terminal unit manufacturer.
7. Variable frequency drives.

B. Products Installed But Not Supplied Under This Section:

1. None.

C. Products Not Furnished or Installed But Integrated with the Work of This Section:

1. Packaged HVAC equipment internal controls.
2. Smoke detectors (through alarm relay contacts).

D. Work Required Under Other Divisions Related to This Section:

1. Power wiring to line side of motor starters, disconnects or variable frequency drives.
2. Provision and wiring of smoke detectors and other devices relating to fire alarm system.
3. Campus LAN (Ethernet) connection adjacent to JACE network management controller.

1.3 RELATED SECTIONS

A. Section 230050 Basic HVAC Materials and Methods
B. Section 238000 Heating, Ventilating and Air Conditioning
C. Section 230593 Testing, Adjusting and Balancing for HVAC

1.4 SYSTEM DESCRIPTION

A. Scope: Furnish all labor, materials and equipment necessary for a complete and operating Building Management System (BMS), utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only. All controllers furnished in this section shall communicate on a peer-to-peer bus over an open protocol bus (Examples: LonTalk, BACnet, Modbus).

1. The intent of this specification is to provide a system that is consistent with BMS systems throughout the owner's facilities running the NiagaraAX Framework.

2. System architecture shall fully support a multi-vendor environment and be able to integrate third party systems via existing vendor protocols including, as a minimum, LonTalk, BACnet and Modbus.
3. System architecture shall provide secure Web access using MS Internet Explorer from any computer on the owner's LAN.
4. All control devices furnished with this Section shall be programmable directly from the NiagaraAX Workbench upon completion of this project. The use of configurable or programmable controllers that require additional software tools for post-installation maintenance shall not be acceptable.
5. Any control vendor that shall provide additional BMS server software shall be unacceptable. Only systems that utilize the NiagaraAX Framework shall satisfy the requirements of this section.
6. The BMS server shall host all graphic files for the control system. All graphics and navigation schemes for this project shall match those that are on the existing campus NiagaraAX Framework server.
7. At minimum, laptop computer including engineering/programming software to modify Operating System Server BMS programs and graphics shall be included. Owner shall receive all Administrator level login and passwords for engineering toolset at first training session. The Owner shall have full licensing and full access rights for all network management, operating system server, engineering and programming software required for the ongoing maintenance and operation of the BMS.
8. OPEN NIC STATEMENTS - All NiagaraAX software licenses shall have the following NiCS: "accept.station.in=*"; "accept.station.out=*"and "accept.wb.in=*"and "accept.wb.out=*". All open NIC statements shall follow Niagara Open NIC specifications.
9. All JACE hardware products used on this project shall be made in the USA or come through the Tridium Richmond, VA shipping facility. JACE hardware products not meeting these requirements will not be allowed.

B. All products of the BMS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided on request, with the submittal package. Systems or products not currently offering the following approvals are not acceptable.

1. Federal Communications Commission (FCC), Rules and Regulations, Volume II -July 1986 Part 15 Class A Radio Frequency Devices.
2. FCC, Part 15, Subpart J, Class A Computing Devices.
3. UL 504 - Industrial Control Equipment.
4. UL 506 - Specialty Transformers.
5. UL 910 - Test Method for Fire and Smoke Characteristics of Electrical and Optical-Fiber Cables Used in Air-Handling Spaces.
6. UL 916 - Energy Management Systems All.
7. UL 1449 - Transient Voltage Suppression.
8. Standard Test for Flame Propagation Height of Electrical and Optical - Fiber Cables Installed Vertically in Shafts.
9. EIA/ANSI 232-E - Interface Between Data Technical Equipment and Data Circuit Terminal Equipment Employing Serial Binary Data Interchange.
10. EIA 455 - Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices.
11. IEEE C62.41- Surge Voltages in Low-Voltage AC Power Circuits.
12. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
13. NEMA 250 - Enclosures for Electrical Equipment.
14. NEMA ICS 1 - Industrial Controls and Systems.
15. NEMA ST 1 - Specialty Transformers.

16. NCSBC Compliance, Energy: Performance of control system shall meet or surpass the requirements of ASHRAE/IESNA 90.1-1999.

1.5 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

1. Actuator: Control device that opens or closes valve or damper in response to control signal.
2. AI: Analog Input.
3. AO: Analog Output.
4. Analog: Continuously variable state over stated range of values.
5. BMS: Building Management System.
6. DDC: Direct Digital Control.
7. Discrete: Binary or digital state.
8. DI: Discrete Input.
9. DO: Discrete Output.
10. FC: Fail Closed position of control device or actuator. Device moves to closed position on loss of control signal or energy source.
11. FO: Fail open (position of control device or actuator). Device moves to open position on loss of control signal or energy source.
12. GUI: Graphical User Interface.
13. HVAC: Heating, Ventilating and Air Conditioning.
14. IDC: Interoperable Digital Controller.
15. ILC: Interoperable Lon Controller.
16. LAN: Local Area Network.
17. Modulating: Movement of a control device through an entire range of values, proportional to an infinitely variable input value.
18. Motorized: Control device with actuator.
19. NAC: Network Area Controller.
20. NC: Normally closed position of switch after control signal is removed or normally closed position of manually operated valves or dampers.
21. NO: Normally open position of switch after control signal is removed; or the open position of a controlled valve or damper after the control signal is removed; or the usual position of a manually operated valve.
22. OSS: Operating System Server, host for system graphics, alarms, trends, etc.
23. Operator: Same as actuator.
24. PC: Personal Computer.
25. Peer-to-Peer: Mode of communication between controllers in which each device connected to network has equal status and each shares its database values with all other devices connected to network.
26. P: Proportional control; control mode with continuous linear relationship between observed input signal and final controlled output element.
27. PI: Proportional-Integral control, control mode with continuous proportional output plus additional change in output based on both amount and duration of change in controller variable (reset control).
28. PICS: BACnet Product Interoperability Compliance Statement.
29. PID: Proportional-Integral-Derivative control, control mode with continuous correction of final controller output element versus input signal based on proportional error, its time history (reset) and rate at which it's changing (derivative).
30. Point: Analog or discrete instrument with addressable database value.
31. WAN: Wide Area Network.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 30 00.
B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Submit documentation of contractor qualifications, including those indicated in "Quality Assurance" if requested by the A-E.
D. X copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers' catalog data sheets and installation instructions. Submit in printed electronic format. Samples of written Controller Checkout Sheets and Performance Verification Procedures for applications similar in scope shall be included for approval.
E. Shop drawings shall also contain complete wiring and schematic diagrams, sequences of operation, control system bus layout and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings.
F. Upon completion of the work, provide x complete sets of ' as-built' drawings and other project-specific documentation in 3-ring hard-backed binders and on Flash media.
G. Any deviations from these specifications or the work indicated on the drawings shall be clearly identified in the Submittals.

1.7 QUALITY ASSURANCE

A. The Control System Contractor shall have a full service DDC office within 50 miles of the job site. This office shall be staffed with applications engineers, software engineers and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment necessary to support this work, as well as staff trained in the use of this equipment.
B. Single Source Responsibility of Supplier: The Control System Contractor shall be responsible for the complete installation and proper operation of the control system. The Control System Contractor shall exclusively be in the regular and customary business of design, installation and service of computerized building management systems similar in size and complexity to the system specified. The Control System Contractor shall be the manufacturer of the primary DDC system components or shall have been the authorized representative for the primary DDC components manufacturer for at least 5 years. All control panels shall be assembled by the Control System Contractor in a UL-Certified 508A panel shop.
C. Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in the production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use.

1.8 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.9 DELIVERY, STORAGE AND HANDLING

A. Maintain integrity of shipping cartons for each piece of equipment and control device through shipping, storage and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.10 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers and structural and architectural features.

1.11 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Honeywell Building Control Systems, buildingcontrols.honeywell.com
B. Substitutions: Not permitted.
C. Requests for substitutions will be considered in accordance with provisions of Section 0160 00.

2.2 GENERAL

A. The Building Management System (BMS) shall be comprised of a network of interoperable, stand-alone digital controllers, a network area controller, graphics and programming and other control devices for a complete system as specified herein.
B. The installed system shall provide secure password access to all features, functions and data contained in the overall BMS.

2.3 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURE

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system utilizing Open protocols in one open, interoperable system.
B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. Physical connection of any BACnet control equipment, such as chillers, shall be via Ethernet or IP.
C. All components and controllers supplied under this contract shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.
D. The supplied system shall incorporate the ability to access all data using Java enabled browsers without requiring proprietary operator interface and configuration programs. An Open Database Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on the Operating System Server located in the Facilities Office on the LAN. Systems requiring proprietary database and user interface programs shall not be acceptable.
E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.

    1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.

2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.4 SYSTEM NETWORK CONTROLLER (SNC)

A. These controllers are designed to manage communications between the programmable equipment controllers (PEC), application specific controllers (ASC) and advanced unitary controllers (AUC) which are connected to its communications trunks, manage communications between itself and other system network controllers (SNC) and with any operator workstations (OWS) that are part of the BAS, and perform control and operating strategies for the system based on information from any controller connected to the BAS.

B. The controllers shall be fully programmable to meet the unique requirements of the facility it shall control.

C. The controllers shall be capable of peer-to-peer communications with other SNC's and with any OWS connected to the BAS, whether the OWS is directly connected, connected via modem or connected via the Internet.

D. The communication protocols utilized for peer-to-peer communications between SNC's will be Niagara AX, BACnet TCP/IP and SNMP. Use of a proprietary communication protocol for peer-to-peer communications between SNC's is not allowed.

E. The SNC shall be capable of executing application control programs to provide:

1. Calendar functions.
2. Scheduling.
3. Trending.
4. Alarm monitoring and routing.
5. Time synchronization.
6. Integration of LonWorks, BACnet, and ModBus controller data.
7. Network management functions for all SNC, PEC and ASC based devices.

F. The SNC shall provide the following hardware features as a minimum:

1. One Ethernet Port-10/100 Mdps.
2. One RS-232/485 port.
3. One LonWorks Interface Port - 78KB FTT-10A.
4. Battery Backup.
5. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller shall contain a hard disk with at least 1 gigabyte storage capacity).

G. The SNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.

H. The SNC shall provide alarm recognition, storage, routing, management and analysis to supplement distributed capabilities of equipment or application specific controllers.

I. The SNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up, telephone connection, or wide-area network.

1. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but not limited to:

a. Alarm.
b. Return to normal.
c. To default.

2. Alarms shall be annunciated in any of the following manners as defined by the user:

a. Screen message text.
b. Email of complete alarm message to multiple recipients.
c. Pagers via paging services that initiate a page on receipt of email message.
d. Graphics with flashing alarm object(s).

3. The following shall be recorded by the SNC for each alarm (at a minimum):

a. Time and date.
b. Equipment (air handler #, access way, etc.).
c. Acknowledge time, date, and user who issued acknowledgement.

J. Programming software and all controller "Setup Wizards" shall be embedded into the SNC.

2.5 PROGRAMMABLE EQUIPMENT CONTROLLER (PEC)

A. HVAC control shall be accomplished using LonMark or BACnet based devices where the application has a LonMark profile or BTL Listed PICS defined. Where LonMark devices are not available for a particular application, devices based on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier shall provide an XIF file for the device. The controller platform shall provide options and advanced system functions, programmable and configurable using NiagaraAX Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".
B. All PECs shall be application programmable and shall at all times maintain their certification. All control sequences within or programmed into the PEC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery to be retained.
C. The PECs shall communicate with the SNC at a baud rate of not less than 78.8K baud. The PEC shall provide LED indication of communication and controller performance to the technician, without cover removal.
D. The following integral and remote Inputs/Outputs shall be supported per each PEC:

1. Eight integral dry contact digital inputs.
2. Any two digital inputs may be configured as pulse counters with a maximum pulse read rate of 15 Hz.
3. Eight integral analog inputs (configurable as 0-10V, 0-10,000 ohm or, 20K NTC).
4. Six integral 4-20 ma analog outputs.
5. Eight integral 24 Vac Triac digital outputs, configurable as maintained or floating motor control outputs.
6. One integral 20 Vdc, 65-mA power supply for auxiliary devices.
7. If a 20 Vdc 65-mA power supply terminal is not integral to the PEC, provide at each PEC a separate, fully isolated, enclosed, current limited and regulated UL listed auxiliary power supply for power to auxiliary devices.

E. Each PEC shall have expansion ability to support additional I/O requirements through the use of remote input/output modules.
F. PEC Controllers shall support at minimum the following control techniques:

1. General-purpose control loops that can incorporate Demand Limit Control strategies, Setpoint reset, adaptive intelligent recovery, and time of day bypass.
2. General-purpose, non-linear control loops.
3. Start/stop Loops.
4. If/Then/Else logic loops.
5. Math Function loops (MIN, MAX, AVG, SUM, SUB, SQRT, MUL, DIV, ENTHALPY).

2.6 ADVANCED UNITARY CONTROLLER

A. The advanced unitary controller (AUC) platform shall be designed specifically to control HVAC - ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: constant volume air handlers, VAV air handlers, packaged RTU, heat pumps, unit vents, fan coils, natural convection units and radiant panels. The control shall use LonMark or BACnet based devices where the application has a LonMark profile or BTL Listed PICS defined. Where LonMark devices are not available for a particular application, devices based on LonWorks shall be acceptable. For each LonWorks device that does not have LonMark certification, the device supplier shall provide an XIF file for the device. The controller platform shall provide options and advanced system functions, programmable and configurable using NiagaraAX Framework, that allow standard and customizable control solutions required in executing the "Sequence of Operation".

B. Minimum Requirements:

1. The controller shall be fully programmable with full functionality on any NiagaraAX brand platform.
    a. Support downloads to the controller from any brand of NiagaraAX platform.
    b. Support uploads from the controller to any brand of NiagaraAX platform.
    c. Support simulation/debug mode of the controller.
    d. Maintain native GUI.
    e. Native function-block programming within the NiagaraAX environment.
2. The controller shall be capable of either integrating with other devices or stand-alone operation.
3. The controller shall have two microprocessors. The Host processor contains on-chip FLASH program memory, FLASH information memory, and RAM to run the main HVAC application. The second processor for network communications. Controller memory minimum requirements include:
    a. FLASH Memory Capacity: 60 Kilobytes with 8 Kilobytes for application program.
    b. FLASH Memory settings retained for ten years.
    c. RAM: 2 Kilobytes.
4. The controller shall have an internal time clock with the ability to automatically revert from a master time clock on failure.
    a. Operating Range: 24 hour, 365 day, multi-year calendar including day of week and configuration for automatic day-light savings time adjustment to occur on configured start and stop dates.
    b. Accuracy: ±1 minute per month at 77 degrees F (25 degrees C).
    c. Power Failure Backup: 24 hours at 32 degrees to 122 degrees F (0 degrees to 50 degrees C).
5. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
6. The controller shall have an internal DC power supply to power external sensors.
    a. Power Output: 20 VDC ±10% at 75 mA.
7. The controller shall have a visual indication (LED) of the status of the devise:
    a. Controller operating normally.
    b. Controller in process of download.
    c. Controller in manual mode under control of software tool.
    d. Controller lost its configuration.
    e. No power to controller, low voltage, or controller damage.
    f. Processor and/or controller are not operating.

8. The minimum controller Environmental ratings.
    a. Operating Temperature Ambient Rating: -40 degrees to 150 degrees F (-40 degrees to 65.5 degrees C).
    b. Storage Temperature Ambient Rating: -40 degrees to 150 degrees F (-40 degrees to 65.5 degrees C).
    c. Relative Humidity: 5% to 95% non-condensing.
9. The controller shall have the additional approval requirements, listings, and approvals:
    a. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
    b. CSA (LR95329-3) Listed.
    c. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
    d. Meets Canadian standard C108.8 (radiated emissions).
    e. Conforms requirements European Consortium standard EN 61000-6-1; 2001 (EU Immunity).
    f. Conforms requirements European Consortium standard EN 61000-6-3; 2001 (EU Emission).
10. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).
11. The controller shall have a mix of digital inputs (DI), digital Triac outputs (DO), analog outputs (AO), and universal inputs (UI).
    a. Analog outputs (AO) shall be capable of being configured as digital outputs (DO).
    b. Input and Output wiring terminal strips shall be removable from the controller without disconnecting wiring.
    c. Input and Output wiring terminals shall be designated with color coded labels.
    d. Universal inputs shall be capable of being configured as binary inputs, resistive inputs, voltage inputs (0-10 VDC), or current inputs (4-20 mA).
12. The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
13. The controller platform shall have standard HVAC application programs that are modifiable to support both the traditional and specialized "sequence of operations" as outlined in Section 4.
    a. Discharge air control and low limit.
    b. Pressure-dependent dual duct without flow mixing.
    c. Variable air volume with return flow tracking.
    d. Economizer with differential enthalpy.
    e. Minimum airflow coordinated with CO2.
    f. Unit ventilator cycle (1, 2, 3) 2-pipe.
    g. Unit ventilator cycle (1, 2, 3) 2-pipe with face/bypass.
    h. Unit ventilator cycle (1, 2, 3) 4-pipe.
    i. Unit ventilator cycle (1, 2, 3) 4-pipe with EOC valve.

2.7 OTHER CONTROL SYSTEM HARDWARE

A. Motorized control dampers that will not be integral to the equipment shall be furnished by the Control System Contractor. Control damper frames shall be constructed of galvanized steel, formed into changes and welded or riveted. Dampers shall be galvanized, with nylon bearings. Blade edge seals shall be vinyl. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-gauge minimum and 6 inches wide maximum and frame shall be of welded channel

iron. Damper leakage shall not exceed 10 CFM per square foot, at 1.5 inches water gauge static pressure.

B. Control damper actuators shall be furnished by the Control System Contractor. Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 in-lb torque per square foot of damper area. Damper actuators shall be spring return type. Operators shall be heavy-duty electronic type for positioning automatic dampers in response to a control signal. Motor shall be of sufficient size to operate damper positively and smoothly to obtain correct sequence as indicated. All applications requiring proportional operation shall utilize truly proportional electric actuators.

C. Control Valves: Control valves shall be 2-way or 3-way pattern as shown and constructed for tight shutoff at the pump shut-off head or steam relief valve pressure. Control valves shall operate satisfactorily against system pressures and differentials. Two-position valves shall be ' line' size. Proportional control valves shall be sized for a maximum pressure drop of 5.0 psi at rated flow (unless otherwise noted or scheduled on the drawings). Valves with sizes up to and including 2 inches (51 mm) shall be "screwed" configuration and 2-1/2 inches (63.5 mm) and larger valves shall be "flanged" configuration. All control valves, including terminal unit valves, less than 2 inches (51 mm) shall be globe valves. Electrically-actuated control valves shall include spring return type actuators sized for tight shut-off against system pressures (as specified above) and, when specified, shall be furnished with integral switches for indication of valve position (open-closed). Pneumatic actuators for valves, when utilized, shall be sized for tight shut-off against system pressures (as specified above).

D. Control Valve Actuators: Actuators for VAV terminal unit heating coils shall be "drive-open; drive-closed" type. All actuators shall have inherent current limiting motor protection. Valve actuators shall be 24-volt, electronic type, modulating or two-position as required for the correct operating sequence. Actuators on valves needing ' fail-safe' operation shall have spring return to Normal position. Modulating valves shall be positive positioning in response to the signal. All valve actuators shall be UL listed.

E. All control valves 2-1/2 inches (63.5 mm) or larger shall have position indication. All hot water control valves shall be Normally-Open arrangement; all chilled water control valves shall be Normally-Closed arrangement.

F. Wall Mount Room Temperature sensors: Each room temperature sensor shall provide temperature indication to the digital controller, provide the capability for a software-limited occupant set point adjustment (warmer-cooler slider bar or switch) and limited operation override capability. Room Temperature Sensors shall be 20,000-ohm thermistor type with a temperature range of -40 to 140 degrees F (-38 to 60 degrees C). The sensor shall be complete with a decorative cover and suitable for mounting over a standard electrical utility box. These devices shall have an accuracy of 0.5 degrees F (.024 degrees C) over the entire range.

G. Duct-mounted and Outside Air Temperature Sensors: 20,000-ohm thermistor temperature sensors with an accuracy of ± 0.2 degrees C. Outside air sensors shall include an integral sun shield. Duct-mounted sensors shall have an insertion measuring probe of a length appropriate for the duct size, with a temperature range of -40 to 160 degrees F(-38 to 71 degrees C) The sensor shall include a utility box and a gasket to prevent air leakage and vibration noise. For all mixed air and preheat air applications, install bendable averaging duct sensors with a minimum 8 feet (2438 mm) long sensor element. These devices shall have accuracy of 0.5 degrees F (.024 degrees C) over the entire range.

H. Humidity sensors shall be thin-film capacitive type sensor with on-board nonvolatile memory, accuracy to plus or minus two percent (2%) at 0 to 90% RH, 12 - 30 VDC input voltage, analog output (0 - 10 VDC or 4 - 20mA output). Operating range shall be 0 to 100% RH and 32 to 140 degrees F (0 to 60 degrees C). Sensors shall be selected for wall, duct or outdoor type installation as appropriate.

I. Carbon Dioxide Sensors (CO2): Sensors shall utilize Non-dispersive infrared technology (N.D.I.R.), repeatable to plus or minus 20 PPM. Sensor range shall be 0 - 2000 PPM. Accuracy

shall be plus or minus five percent (5%) or 75 PPM, whichever is greater. Response shall be less than one minute. Input voltage shall be 20 to 30 VAC or DC. Output shall be 0 - 10 VDC. Sensor shall be wall or duct mounted type, as appropriate for the application, housed in a high impact plastic enclosure.

J. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.

K. Differential Analog (duct) Static Pressure Transmitters Provide a pressure transmitter with integral capacitance type sensing and solid-state circuitry. Accuracy shall be plus or minus 1% of full range; range shall be selected for the specific application. Provide zero and span adjustment capability. Device shall have integral static pickup tube.

L. Differential Air Pressure Switches: Provide SPDT type, UL-approved, and selected for the appropriate operating range where applied. Switches shall have adjustable setpoints and barbed pressure tips.

M. Water Flow Switches: Provide a SPST type contact switch with bronze paddle blade, sized for the actual pipe size at the location. If installed outdoors, provide a NEMA-4 enclosure. Flow switch shall be UL listed.

N. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel shall be factory wired. Control panel shall be assembled by the BMS in a UL-Certified 508A panel shop. A complete set of ' as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

O. Pipe and Duct Temperature sensing elements: 20,000-ohm thermistor temperature sensors with and accuracy of ±1% accuracy. Their range shall be -5 to 250 degrees F (-20 to 121 degrees C). Limited range sensors shall be acceptable provided they are capable of sensing the range expected for the point at the specified accuracy. Thermal wells with heat conductive gel shall be included.

P. Low Air Temperature Sensors: Provide SPST type switch, with 15 to 55 degrees F (-9 to 13 degrees C), range, vapor-charged temperature sensor. Honeywell model L482A, or approved equivalent.

Q. Relays: Start/stop relay model shall provide either momentary or maintained switching action as appropriate for the motor being started. All relays shall be plugged in, interchangeable, mounted on a subbase and wired to numbered terminals strips. Relays installed in panels shall all be DPDT with indicating lamp. Relays installed outside of controlled devices shall be enclosed in a NEMA enclosure suitable for the location. Relays shall be labeled with UR symbol. RIB-style relays are acceptable for remote enable/disable.

R. Emergency Stop Switches: Provide toggle-type switch with normally-closed contact. Switch shall be labeled "AIR HANDLER EMERGENCY SHUTOFF, NORMAL - OFF.".

S. Transducers: Differential pressure transducers shall be electronic with a 4-20 mA output signal compatible to the Direct Digital Controller. Wetted parts shall be stainless steel. Unit shall be designed to operate in the pressure ranges involved.

T. Control Power Transformers: Provide step-down transformers for all DDC controllers and devices as required. Transformers shall be sized for the load, but shall be sized for 50 watts, minimum. Transformers shall be UL listed Class 2 type, for 120 VAC/24 VAC operation.

U. Line voltage protection: All DDC system control panels that are powered by 120 VAC circuits shall be provided with surge protection. This protection is in addition to any internal protection provided by the manufacturer. The protection shall meet UL, ULC 1449, IEEE C62.41B. A grounding conductor, (minimum 12 AWG), shall be brought to each control panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 GENERAL

A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
B. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the Control System Contractor in accordance with these specifications.
C. Equipment furnished by the Mechanical Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the Control System Contractor.
D. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.4 WIRING

A. All electrical control wiring to the control panels shall be the responsibility of the Control System Contractor.
B. All wiring shall be in accordance with the Project Electrical Specifications (Division 16), the National Electrical Code and any applicable local codes. All control wiring shall be installed in raceways.
C. Excess wire shall not be looped or coiled in the controller cabinet.
D. Incorporate electrical noise suppression techniques in relay control circuits.
E. There shall be no drilling on the controller cabinet after the controls are mounted inside.
F. Careful stripping of wire while inside the cabinet is required to ensure that no wire strand fragments land on circuit boards.
G. Use manufacturer-specified wire for all network connections.
H. Use approved optical isolation and lightning protection when penetrating building envelope.
I. Read installation instructions carefully. Any unavoidable deviations shall be approved by owner's rep prior to installation.

3.5 ACCEPTANCE TESTING

A. Upon completion of the installation, the Control System Contractor shall load all system software and start-up the system. The Control System Contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
B. The Control System Contractor shall perform tests to verify proper performance of components, routines and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.

C. System Acceptance: Satisfactory completion is when the Control System Contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR TRAINING

A. During system commissioning and at such time acceptable performance of the Control System hardware and software has been established, the Control System Contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.
B. The Control System Contractor shall provide 80 total hours of comprehensive training in multiple sessions (80 hours total) for system orientation, product maintenance and troubleshooting, programming and engineering, if not provided under a previous contract at the site using the same brand and type of controllers within the previous 3 years. These classes are to be spread out during the 1st year warranty period. The first class starting after final commissioning and the last class is to be in the last month of 1-year warranty period.
C. The Control System Contractor shall provide 16 hours (total) of instruction to the owner's designated personnel on the operation of the BMS and describe its intended use with respect to the programmed functions specified. Operator orientation of the BMS shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories and appropriate operator intervention required in responding to the System's operation.

3.7 WARRANTY PERIOD SERVICES

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
B. Within this period, upon notice by the Owner, any defects in the BMS due to faulty materials, methods of installation or workmanship shall be promptly repaired or replaced by the Control System Contractor at no expense to the Owner.
C. Maintenance of Computer Software Programs: The Control System Contractor shall maintain all software during the warranty period. In addition, all factory or sub-vendor upgrades to software shall be added to the systems, when they become available, at no additional cost. New products are not considered upgrades in this context.
D. Maintenance of Control Hardware: The Control System Contractor shall inspect, repair, replace, adjust, and calibrate, as required, the controllers, control devices and associated peripheral units during the warranty period. The Control System Contractor shall then furnish a report describing the status of the equipment, problem areas (if any) noticed during service work, and description of the corrective actions taken. The report shall clearly certify that all software is functioning correctly.
E. Service Period: Calls for service by the Owner shall be honored within 24 hours and are not to be considered as part of routine maintenance.
F. Service Documentation: A copy of the service report associated with each owner-initiated service call shall be provided to the owner.

3.8 WARRANTY ACCESS

A. The Owner shall grant to the Control System Contractor reasonable access to the BMS during the warranty period. Remote access to the BMS (for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period) will be allowed.

3.9 OPERATION & MAINTENANCE MANUALS

A. See Division 1 for requirements. O&M manuals shall include the following elements, as a minimum:

1. As-built control drawings for all equipment.
2. As-built Network Communications Diagram.
3. General description and specifications for all components.
4. Completed Performance Verification sheets.
5. Completed Controller Checkout/Calibration Sheets.

3.10 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 26 08 00 – COMMISSIONING OF ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Definitions, warranties, test equipment requirements, and electrical commissioning requirements as required for LEED Certification.

1.2 RELATED SECTIONS

A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.
B. Section 01 91 13, General Commissioning Requirements

1.3 WARRANTY

A. Manufacturer's Warranty:

1. Commissioning, inspecting, and testing not to modify terms or time periods of electrical equipment, systems, and controls warranties including related equipment and systems, and adjacent work.
2. Electrical system warranties to start from date of Commissioning Agent acceptance.

1.4 REFERENCES AND STANDARDS

A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.
B. In addition, reference:

1. ASHRAE Guideline 0, The Commissioning Process.
2. NECA 90, Commissioning Building Electrical Systems.

1.5 SUBMITTALS

A. Reference Section 01 91 13, General Commissioning Requirements, for specific submittal requirements.
B. In addition, submit the following:

1. Certificates of readiness
2. Certificates of completion of installation, prestart, and startup activities
3. O&M manuals
4. Test reports

1.6 COORDINATION

A. Reference Section 01 91 13, General Commissioning Requirements, for requirements pertaining to coordination during the commissioning process.

1.7 DEFINITIONS

A. Commissioning Authority: Commissioning Agent, representing the Owner and directing commissioning activities.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Provide testing equipment required to perform startup, initial checkout and functional performance testing for the equipment being tested under Division 26, Electrical. Furnish two-way radios for each testing participant.

B. Furnish special equipment, tools and instruments (specific to tested equipment and only available from vendor) required for testing. At conclusion of commissioning, turn equipment over to the Owner except for stand-alone data logging equipment that may be used by the Commissioning Authority.

C. Manufacturer: Furnish proprietary test equipment and software required by equipment manufacturer procedures for programming and/or start-up. Demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) to become the property of the Owner upon completion of the commissioning process.

D. Testing equipment to be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the installing contractors, the Commissioning Authority will prepare Pre-Functional Checklists for commissioned components, equipment, and systems

B. Red-Lined Drawings:

1. Verify equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Record the red-lined drawing changes, as a result of Functional Testing and incorporate into the final as-built drawings.

C. Operation and Maintenance Data:

1. Submit a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for commissioned equipment and systems.
2. The Commissioning Authority will review the O&M literature once for conformance to project requirements.
3. The Commissioning Authority will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Demonstration and Training:

1. Provide demonstration and training as required by the specifications.
2. Submit complete training plan and schedule to the Commissioning Authority four weeks prior to training.
3. Submit training agenda for each training session to the Commissioning Authority one week prior the training session.
4. Notify the Commissioning Authority at least 72 hours in advance of scheduled tests so that testing may be observed by the Commissioning Authority and Owner's representative. Submit copies of the test record to the Commissioning Authority, Owner, and Architect.
5. Engage a Factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specific equipment.
6. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.

7. Review data in O&M Manuals.

3.2 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the Commissioning Authority.
B. Attend construction phase controls coordination meetings.
C. Participate in Electrical systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the Commissioning Authority.
D. Provide information requested by the Commissioning Authority for final commissioning documentation.
E. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.
F. Prepare preliminary schedule for Electrical system orientation and inspections, operation and maintenance manual submissions, training sessions, equipment start-up and task completion for owner. Distribute preliminary schedule to commissioning team members.
G. Update schedule as required throughout the construction period.
H. During the startup and initial checkout process, execute the related portions of the prefunctional checklists for commissioned equipment.
I. Assist the Commissioning Authority in verification and functional performance tests.
J. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
K. Gather operation and maintenance literature on equipment, and assemble in binders as required by the specifications. Submit to Commissioning Authority 45 days after submittal acceptance.
L. Coordinate with the Commissioning Authority to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
M. Participate in, and schedule vendors and contractors to participate in the training sessions.
N. Provide written notification to the CM/GC and Commissioning Authority that the following work has been completed in accordance with the Contract Documents, and that the equipment, systems, and sub-system are operating as required.

1. Electrical equipment including switchgear, panel boards, motor control centers, lighting, receptacles, dimmers and other equipment furnished under this Division.
2. Lighting Controls

O. Obtain performance documentation from equipment supplier.
P. Provide training of the Owner's operating staff using expert qualified personnel.
Q. Equipment Suppliers:

1. Submit requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
2. Assist in equipment testing per agreements with contractors.
3. Provide information requested by Commissioning Authority regarding equipment sequence of operation and testing procedures.

3.3 TESTING PREPARATION

A. Certify in writing to the Commissioning Authority that Electrical systems, subsystems, and equipment have been installed and started and are operating according to the Contract Documents.
B. Certify in writing to the Commissioning Authority that Electrical instrumentation and control systems have been completed and that they are operating according to the Contract Documents.

C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.
D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, emergency power, and alarm conditions).
E. Inspect and verify the position of each device and interlock identified on checklists.
F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the Commissioning Authority.

3.4 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the Commissioning Authority.
B. Scope of Electrical testing includes the entire Electrical installation, from the incoming power equipment throughout the distribution system. Testing includes measuring, but is not limited to resistance, voltage, and amperage of system(s) and devices.
C. Test operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
D. The Commissioning Authority along with the Electrical contractor and other contracted subcontractors, including the fire alarm Subcontractor to prepare detailed testing plans, procedures, and checklists for Electrical systems, subsystems, and equipment.
E. Tests will be performed using design conditions whenever possible.
F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the Commissioning Authority and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
G. The Commissioning Authority may direct that set points be altered when simulating conditions is not practical.
H. The Commissioning Authority may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
I. If tests cannot be completed because of a deficiency outside the scope of the Electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.5 ELECTRICAL SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Electrical Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 26, Electrical Sections "Instrumentation and Control" and "Sequence of Operations" Assist the Commissioning Authority with preparation of testing plans.
B. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of components, systems and sub-systems. Evaluate the following equipment and systems:

    1. Lighting Controls

3.6 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

A. Reference Section 01 91 13, General Commissioning Requirements for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.7 OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals to conform to Contract Documents requirements as stated in Division 26, Electrical.

3.8 TRAINING OF OWNER PERSONNEL

A. Electrical Contractor's training responsibilities:

1. Provide the Commissioning Authority with a training plan two weeks before the planned training.
2. Provide designated Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
3. Training starts with classroom sessions, if necessary, followed by hands on training on each piece of equipment, which illustrates the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative provides the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
6. The training sessions follows the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training Includes:

    a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training includes start-up, operation in modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discuss relevant health and safety issues and concerns.
    d. Discuss warranties and guarantees.
    e. Cover common troubleshooting problems and solutions.
    f. Explain information included in the O&M manuals and the location of plans and manuals in the facility.
    g. Discuss any peculiarities of equipment installation or operation.

8. Hands-on training includes start-up, operation in modes possible, including manual, shut-down and any emergency procedures and preventative maintenance of pieces of equipment.

9. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
10. Schedule training after functional testing is complete, unless approved otherwise by the Owner.

END OF SECTION

SECTION 26 53 10 – EXHIBIT LIGHTING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. General

1. Provide R21 Strand Power Raceway and compatible dimming system.

1.2 SUBMITTALS

A. Product Data: Provide complete submittals and shop drawings with required components and mounting hardware.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Strand Lighting or approved equal.

2.2 FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.

2.3 R21 POWERED RACEWAY

A. GENERAL
1. The powered raceway shall be fully digital and designed specifically for entertainment lighting applications, and shall consist of power distribution raceway as specified on the system drawings and this specification.
2. System setup and preset data shall, as standard, be fully user programmable on a per raceway or system wide basis.

B. MECHANICAL
1. Each raceway shall be formed of cold-rolled steel sections. Exterior surfaces shall be finished in fine-textured, scratch-resistant powder coat paint. Interior surfaces shall have a corrosion-resistant finish.
2. Raceway sections shall be 8’ long. Height of each section shall not exceed 6”. Width of each section shall not exceed 3-1/2”. Overall length of combined sections shall not exceed 96’ long. Each Intelligent Raceway shall produce no mechanical noise.

3. The dimming system shall meet or exceed FCC 'Class A' standards for RFI/EMI emissions.
4. A variety of hangers shall be available to mount the raceway to rigging systems, walls or catwalks.
5. The system shall be UL and cUL listed and approved.

C. INSTALLATION
1. The raceway shall be factory pre-wired and dressed. The contractor shall provide and terminate all feed, load and control wiring on screw terminals fitted within the raceway.
2. All terminations and internal wiring shall be accessible via a removable front cover panel. The Processor Module shall be accessible for programming at all time.
3. Mounting brackets for wall mount and attachments for a wide range of rigging systems shall be provided as specified.

D. ELECTRICAL
1. The power efficiency of the dimmer cabinet shall be greater than 97% at full load. Voltage drop shall not exceed 3 volts.
2. The system ground shall be made at a grounding lug in raceway termination area..
3. All equipment shall be UL and cUL listed.

E. SYSTEM ELECTRONICS MODULE
1. The main dimmer control electronics shall be available in two configurations. A rack mount processor for control of up to 96 dimmers may be centrally located for ease of service and support or processors may be remote mounted directly on the raceway as required.
2. All rack setup and preset data shall be stored in a non-volatile manner and may be transferred to a replacement Rack Processor Module without losing data.
3. Each Rack Processor Module shall have a back-lit LCD display with a keypad for rack setup, preset control, testing, rack status, error and diagnostics.
4. LEDs shall indicate "Network Connection", DMX512 input and Power
5. All rack setup and preset data shall be transferable to and from a networked library storage device on a per rack or system wide basis.
6. The Processor Module shall be permanently mounted in an equipment rack or on the raceway itself as required. The processor shall provide all necessary low voltage signal connections. The processor shall provide the only point for contractor connection of control input connections. The contractor connections shall be made with two screw terminals or crimped RJ45 connectors for ease of installation.
7. Systems with remote mounted processors shall connect to the Powered Raceway over Belden XXXX 3 pair cable in a daisy chain. An optional data splitter for star wiring shall also be available.
8. All DMX512 input connections shall be optically isolated from all processor electronics by a minimum of 2,500V RMS isolation.
9. The Rack Processor shall support up to 96 dimmers.

F. PROCESSOR CONTROL AND COMMUNICATIONS
1. The control electronics shall provide the following control and communication inputs as standard:
2. An Ethernet control input. This input can support a connection to a Strand ShowNet system, and shall be supplied Advanced Network Control (ACN) ready. Each Ethernet control input can generate Reporting messages for the dimmer rack. This input shall also allow for local connection to a personal computer, providing setup, playback, library storage, dimming reporting features, and the ability to load rack-operating software.
3. One optically isolated DMX512 control inputs.

G. PROCESSOLR, FEATURES

1. The rack electronics shall provide two levels of operator interface:
   a. A local standard interface that includes 6 menu keys and a bitmapped backlit LCD display (minimum 20 character x 4 line) to access standard system menus.
   b. A networked customizable Web based interface that includes status displays, configuration and maintenance utilities, integrated on-line help system, and alert emails. Support for wireless PDA's shall allow query and control functions.
   c. Each RPM will be imbedded with a unique serial number and password system.

2. The dimmer control electronics shall have 16 bit (minimum) fade processing and a dimmer update rate better than 16 ms (60 Hz) or 20 ms (50 Hz). Dimmers set to the same level shall output within +/-.5V of each other, regardless of phase or input voltage, providing the desired level is less than the phase input voltage less the dimmer insertion voltage.

3. As a standard, dimmer rack status reporting shall report the following conditions/data:
   a. Present power line voltage
   b. Connected lamp wattage
   c. Present output setting
   d. Dimmer operating temperature
   e. Dimming mode
   f. Overload condition
   g. No load condition
   h. Focus mode
4. The control electronics shall provide the following setup functions that shall be user programmable on a per rack or system wide basis:
   a. DMX512 Port A patch.
   b. Set dimmer max. voltage (12V - 260V in 1V steps).
   c. Set dimmer min. level (0 to 99%).

5. The DMX512 shall support a rack start address and individual dimmer patch.
6. It shall be possible to load new rack operating software via the Ethernet connection to the dimmer rack. There shall be no requirement to turn power to the rack off during the loading of rack software. It shall be possible to load new rack operating software into the processor, regardless of the state of the program storageThe Low-Voltage LED cove lighting system shall consist of DMX512A compatible, individually addressable, modules with a 140˚ x 140˚ beam angle, each being 12.125" or shorter. The RGB system must allow 16-bits of precision per color and 48-bits per fixture. The *warm* white light system allows for 16-bits of precision for each fixture.

2.4 POWER MODULES

A. GENERAL

1. The dimmers shall use IGBTs (Insulated Gate Bipolar Transistors) to regulate and control load voltage. Dimmers using hard-switching semiconductor devices, such as SCRs or other thyristors, shall not be acceptable. The dimmers shall not use filter chokes to control the rate of rise in the load current waveform.

B. ELECTRICAL

1. Each dimmer module shall contain two dimmers, each capable of controlling a 2400 watt load. Total load capacity of each dimmer module shall be capped at 20 Amps. If the load capacity is exceeded, the module shall automatically turn-off the last load energized

2. Dimmer electronics shall be completely solid state.

3. The dimmers shall be immune from damage caused by output short-circuits between load and neutral or load and ground.

C. PERFORMANCE

1. The insertion loss (voltage drop across the complete dimmer at full load current while producing a full output sine wave) shall be less than three volts RMS. Insertion loss at reduced dimmer loading shall not vary significantly from that produced with a full rated load. Dimmers with insertion loss greater than three volts RMS at full rated load shall not be acceptable.

2. The dimmers shall use Digital Power Envelope Processing to regulate dimmer output to within +/- 0.5 volts RMS of the assigned setting. Regulating response shall occur in the same power line cycle as the disturbance when the dimmer is in Reverse Phase Control (RPC) mode.

3. The system shall provide status information to any Strand Lighting network control console. The following information shall be reported:
   a. Present power line voltage
   b. Connected lamp wattage
   c. Present output setting
   d. Dimmer operating temperature
   e. Dimming mode
   f. Overload condition
   g. No load condition
   h. Focus mode

4. The dimmers shall hold last received level for a pre-specified period, should the control signal be interrupted.

5. Dimmer Modules shall automatically switch from Reverse Phase Control (RPC) mode to Forward Phase Control (FPC) mode when inductive loads are detected. In RPC mode the dimmer is on from the beginning of the half-cycle until the desired output voltage is reached. In FPC mode, the dimmer turns on within the half-cycle and stays on until the end of the half-cycle. Use of RPC mode, when load type and other conditions permit, reduces the level of lamp filament noise.

6. The system shall also support a low harmonics mode that shall reduce harmonic currents present on the feed neutral conductor by automatically switching the dimmers in the system to an optimum configuration of FPC and RPC operation. The reduction in neutral current shall be a minimum of 33% with a maximum of 100%, depending upon load sizes and their associated levels.

7. When in RPC mode, dimmer output voltage transition time is measured as "fall time". The actual "fall time" generated shall not be affected by the size of the load present. Dimmers shall provide a minimum fall time of 800 µS under normal load current regardless of load.

8. The dimmer transfer function shall comply with the industry standard Square Law dimming curve within a tolerance of +/- 0.5 Volts RMS for all incandescent loads.

9. Each dimmer shall have an associated Focus push button that provides local ON/OFF/LEVEL control for focusing, maintenance and other purposes. If the level set for a dimmer is zero, tapping the Focus button shall set the dimmer output to full. Pressing and holding the Focus button ramps the dimmer output up to any intermediate level. When a non-zero level is received from the controller, the dimmer shall return to normal operation. Tapping the Focus button a second time shall also return the dimmer to normal operation. If a dimmer already has a non-zero level from the control desk, the Focus button flashes the dimmer to full output. In all cases, activating the Focus button shall be reported to the system operator, at the console or system monitor.

10. Each dimmer shall have an LED display to facilitate local reporting of operating conditions.

11. Each dimmer will detect operating conditions and take active measures to protect itself (and the load). Protective measures shall include, but are not limited to the following:

a. At power-up, each dimmer will detect line voltages in excess of 180 VAC. When over-voltage is detected, the dimmer will not turn on its load. The dimmer will also notify the operator and flash its locally mounted LEDs. Dimmers shall withstand line voltages up to 230 VAC for an indefinite period and up to 280 VAC for fifteen minutes with no damage.

b. Each dimmer shall detect

excessive heat sink operating temperatures and notify the console of the condition via system status reporting. The dimmer shall automatically reduce its own "fall time", which minimizes the production of heat. Dimmers will step from 800 µS to 250 µS. If heat continues to rise, the dimmer will shut down, notify the console via IPS Talkback and flash its locally mounted LEDs.

c. Each dimmer shall detect load current in excess of its own rating. An overload will cause a dimmer to shut down, notify the console and flash its locally mounted

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. No cuts are to be made into the dome panels. All cuts into cove trough shall be planned with Astro-Tec manufacturing to insure quality cuts. No cabling shall be visible by walking, standing or sitting audience members. The system shall include all necessary signal cables and mounting hardware.

END OF SECTION

SECTION 26 55 00 – COVE LIGHTING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Pre-Bid Approval Requirement:

1. Led dome lighting technology provider must meet the following specifications and be pre-approved by west valley college or its assigned agent for bid submission. Product description and specifications of the proposed led dome lighting system must be submitted to the architect by the bidder for approval by (insert date), 14 days before the bid submission date (insert date). Approval/rejection of the proposed led dome lighting technology will be published to all prequalified bidders by (insert date), 7 days prior to bid submission deadline.

B. Description:

1. LED Cove lighting for general lighting and special effects. Continuous Cove lighting to consist of two complete rings of LED systems: an RGB LED system and a White Light LED system. Both lighting systems are to mounted in 41’ diameter dome cove trough that is 4” high and 8” deep provided by Astro-Tec Manufacturing Inc.

2. The RGB LED Cove lighting allows dome to be a shell of light that can be any color selected from a palette of 216 by mixing LED intensities. The Supplemental White Light LED system is to serve as work lights for maintenance, cleaning of theater and as classroom instructional lighting.

1.2 SUBMITTALS

A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, and finishes. Clearly identify ballast(s) and lamp(s) for each lighting fixture.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

The selected provider shall provide proof of compliance with known licensing programs and patent claims related to their products.
ChromaCove, LLC, 9000 Bank St Ste B, Cleveland, OH 44125 USA.
Phone: 330-541-LEDS (5337)
Email: sales@chromacove.com

2.2 FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.

2.3 TECHNICAL/PERFORMANCE SPECIFICATIONS

A. The Low-Voltage LED cove lighting system shall consist of DMX512A compatible, individually addressable, modules with a 140˚ x 140˚ beam angle, each being 12.125" or shorter. The RGB system must allow 16-bits of precision per color and 48-bits per fixture. The *warm* white light system allows for 16-bits of precision for each fixture.

B. LED modules shall be arranged/mounted in the 4" high facade x 8" deep dome cove trough such that they provide a continuous 360° illumination of the dome without visible light scallops, hot spots or dark areas near the dome horizon. The fixtures themselves shall not be visible by standing or sitting audience members and shall always provide indirect lighting.

C. The Minimum acceptable integrated up-lighting emission brightness for the RGB LED system with all colors combined at 100% level (white light setting) shall not be less than 138,600 lumens.

D. The Minimum acceptable integrated up-lighting emission brightness for the supplemental White Light LED system at 100% level (white light) shall not be less than 252,000 lumens. This system can be operated separately from the RGB LED system and can be activated by simple wall-mounted switch closure stations for maintenance and cleaning staff usage.

E. Each lighting fixture shall be capable of smooth fading, allowing the fixtures to be dimmed smoothly from full brightness to zero and back to full with no visible flicker, stepping or undesired strobe artifacts visible to a dark-adapted audience.

F. The fixtures shall incorporate a microprocessor-based architecture to ensure smooth and accurate effect fades, between any levels specified between 0 and 100% brightness. Brightness updates shall occur at a rate of 500 updates per second or higher. This rate shall be independent of any internal modulation technique. The internal processor shall interpret the incoming control signals using high-resolution dimming curves optimized for smooth fading at critical low intensity levels required for planetarium use.

G. The LED Cove lighting supplier must provide a manual DMX-512A compatible controller to operate the supplier provided RGB and White light systems. The controller will have physical manual sliders and buttons that the user can manipulate to control all fixtures simultaneously as a group as an override to the programmable control system. This control shall work in exactly the same manner regardless of whether the lighting control computer is powered.

H. The controller shall include additional modes for automatic fading, programmable color presets and automated reaction to audio. This manual controller shall be mounted to the planetarium control console that is to be provided by others. The coordination of size, flush or desk mount and location in the planetarium control console of the DMX controller is to be coordinated before installation.

I. The manual faders shall provide smooth fade control over the lighting with no visible stepping or flicker. It shall be possible for the staff to alter the reactive smoothing so as to select the speed of smoothing of the fades.

J. The same controller will include additional faders (number to be determined before controller design finalized) to control customer supplied DMX addressable RGBW lighting systems for wall, floor and central pit illumination and auxiliary lighting for color, intensity and rate.

K. LED Cove lighting supplier shall provide a GUI computer control system that shall communicate via DMX-512A to the lighting system. This system should be accessible for operation and programming from the planetarium control console. It shall also be capable of controlling additional auxiliary or theatrical lighting connected to DMX dimmers, should such fixtures be added in the future.

L. This LED lighting shall be controllable via a wireless touch-screen remote control (I-PAD type) from anywhere within the theater. The interface should run as an app page on the same device as the theater automation system. It shall be customizable by the customer.

M. Creating colorful effects shall be accomplished by using a graphical user interface that represents the planetarium dome, with each fixture represented, along with cardinal points and user-definable markers for labeling exits and projection areas.

N. The computer based control system shall be used for creating and triggering lighting effects that shall exceed the resolution possible with the manual DMX controller. The effects shall be user-definable with the ability to be edited easily with the GUI including options for save and open. The editor shall allow for control of color, color distribution and blending, brightness, rate, rotation, speed, layers, layer stacking and blending, gradients, etc.

O. Gradient blending of lighting effects shall be possible by adjusting the colors of user-defined control nodes within the interface. The colors represented on-screen and displayed on each fixture shall then smoothly and automatically blend around the dome without requiring the user to specifically program the colors of each fixture directly. The blending shall be such that the colors are anti-aliased from one segment to the next to prevent undesired popping of colors as the effect is rotated. This anti-aliasing control shall be optional for each effect.

P. The cove lighting shall be capable of displaying pre-programmed chase routines and effects via the theater automation system. Standard effects shall include the following at various (programmable) fade rates, positions and rotational speeds:

RGB on

RGB off

White on

White off

All on

All off

Common spectrum (ROYGBIV) of solid colors

Tight and wide rainbow effects

Random

Sweeps

Sparkle on/off

Comet

Strobe pulse

Multi-colored flash

Sunrise/sunset

This effect shall programmatically receive an azimuth from 0˚–360˚ (calibrated to planetarium North) for the center point of the effect. This shall be adjustable to accommodate for the changing seasonal positions of the Sun as seen throughout the year at different latitudes on the Earth.

The effect shall last 2.5 minutes but will allow for modification to take a shorter or longer period of time while keeping the optical effect proportionally the same.

The system shall support the creation of similar custom effects by the user.

The user shall have control over these on-screen buttons to control the size, color, fade rate and function of the buttons, as well as color and brightness of elements of the user interface.

The user shall have the ability to make adjustments to the system and individual fixtures related to their performance through gamma curve correction at both the system and per-fixture level within the control system.

All effects may be triggered manually (if programmed to a button on the manual controller), by the planetarium's automation system or triggered by SMPTE time code

2.4 LIGHTING CONTROL DEVICES

A. Lighting control system must be capable of interfacing with planetarium's architectural "house lighting" via DMX512 protocol. In other words, LED cove lighting GUI should be expandable to control other incandescent and LED planetarium theater lighting and associated dimmers provided by the GC or the owner. This house lighting includes, but is not limited to:

1. 14 Theatrical Lighting fixtures (i.e. ETC Source 4 and Source 4 Mini). Please see the attached plan view of the planetarium theater.
2. LED Theater Wall and Central Pit washes.
3. Exhibit lighting in the adjacent exhibit space.

B. The system shall be capable of basic control via independent switch closures that will operate without the use of the computer. One closure each shall be at a specified location at the entrance, exit and the central pit of the planetarium. Another closure shall be available for connection to an emergency system. It shall be possible to independently select from at least 7 basic colors/intensity for each of these closures.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. No cuts are to be made into the dome panels. All cuts into cove trough shall be planned with Astro-Tec manufacturing to insure quality cuts. No cabling shall be visible by walking, standing or sitting audience members. The system shall include all necessary signal cables and mounting hardware.

END OF SECTION

SECTION 27 00 01 - COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general information that applies to all Division 27 specifications.

B. Related Sections:
1. 27 05 26: Grounding and Bonding of Communication Systems
2. 27 05 36: Communication Cable Pathways
3. 27 08 10: Optical Fiber Testing and Measurement
4. 27 08 20: Copper Testing
5. 27 11 00: Communications Equipment Room Fittings
6. 27 13 00: Communications Backbone Cabling
7. 27 15 00: Communications Horizontal Cabling
8. 27 16 00: Communications Connecting Cords Devices & Adapters

1.2 REFERENCES – TO BE CONSIDERED AS A PART OF THIS SPECIFICATION

A. Most recent editions and addenda of the following documents:

B. TIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant

C. TIA-526-14-B Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant; IEC 61280-4-1 edition 2, Fibre-Optic Communications Subsystem Test Procedure-Part 4-1: Installed cable plant- Multimode attenuation measurement

D. TIA-568-C.0 Generic Telecommunications Cabling for Customer Premises

E. TIA-568-C.1 Commercial Building Telecommunications Cabling Standard

F. TIA-568-C.2 Balanced Twisted Pair Cabling Components

G. TIA-568-C.3 Optical Fiber Cabling Components Standard

H. TIA- 568-C.4 Broadband Coaxial Cabling and Components Standard

I. ANSI/TIA/EIA 569-B Commercial Building Standards For Telecommunications Pathways And Spaces

J. TIA-598-C Optical Fiber Cable Color Coding

K. ANSI/TIA/EIA 606-B The Administration Standard For The Telecommunications Infrastructure Of Commercial Building

L. ANSI/NECA/BICSI—607A - Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

M. ANSI/TIA--607-B & B1 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

N. TIA-758-B Customer-Owned Outside Plant Telecommunications Infrastructure Standard

O. ANSI/TIA/EIA-862 Building Automation Systems Cabling Standard for Commercial Buildings

P. ANSI/TIA-942 Telecommunications Infrastructure Standard for Data Centers

Q. TSB-4979 - Practical Considerations for Implementation of Encircled Flux Launch Conditions in the Field. This bulletin outlines precise specifications that define the launch condition of test sources into multimode fiber which have been standardized and are mandatory for testing optical attenuation of installed multimode cabling per TIA-568.

R. BICSI Telecommunications Distribution Methods Manual (TDMM) 11th Edition

S. BICSI Information Transport Installation Manual (ITSM)

T. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM).

U. Building Industry Consulting Service International (BICSI) Customer Owned Outside Design Manual.

V. ISO/IEC 11801 – Information Technology – Generic Cabling for Customer Premise

W. IEEE 802.3 Standard for Information technology -Telecommunications and information exchange between systems - Local and metropolitan area networks – Specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

X. IEC 61156-1, Multicore and Symmetrical Pair/Quad Cables for Digital Communications – Part 1: Generic Specification, 2005

Y. NFPA-70 National Electrical Code 2008 edition

Z. NECA/BICSI-568-A Standard for Installing Commercial Building Telecommunications Cabling

AA. NESC – National Electrical Safety Code

BB. Federal Communications Commission Part 15 and Part 68

CC. UL 444 – Standard for Safety of Communications Cable

DD. UL 1666 – Standard for Safety of Flame Propagation Height

EE. NFPA 262 – Flame Travel and Smoke of Wires and Cables

FF. Local Authority Having Jurisdiction

1.3 DEFINITIONS / TERMS / ACRONYMS

A. ANSI American Northern Standards Institute

B. AWG American Wire Gauge

C. BICSI Building Industry Consulting Service International

D. BCT Bonding Conductor for Telecommunications

E. COTS Common Off The Shelf Technologies

F. EIA Electronics Industry Alliance

G. ETL Intertek Semko Labs

H. FCC Federal Communications Commission

I. IEC International Electrotechnical Commission

J. IEEE Institute of Electrical and Electronic Engineers

K. IDC Insulation displacement contact

L. ISO International Standards Organization

M. J-STD Joint Standard

N. NECA National Electrical Contractors Association

O. NFPA National Fire Protection Agency

P. NRTL Nationally Recognized Testing Laboratory

Q. SC TIA Standard duplex connector

R. TIA Telecommunications Industry Association

S. UL Underwriters Laboratory

T. As Necessary: That work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.

U. As Required: That work which is required for completed construction and is shown on the drawings or described in the project Specification.

V. Cabling: Cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.

W. Backbone: A facility (e.g., pathway, cable or conductors) between telecommunications rooms, or floor distribution terminals, the entrance facilities and equipment rooms within or between buildings.

X. Backbone Cabling: Cabling and connecting hardware that provides interconnections between telecommunications rooms, equipment rooms, and entrance facilities.

Y. BICSI: Building Industry Consulting Service International.

Z. Concealed: Hidden from sight, buried as in chases, furred spaces, shafts, fixed ceiling or embedded in construction.

AA. Contractor: The installation Contractor responsible for the furnishing and installation of all work indicated within this Specification.

BB. Construction Manager: The Owner's appointed representative.

CC. Equipment Outlet (EO): A device also known as the outlet or information outlet placed at the user workstation for termination using connectors (jacks) of horizontal media for connectivity of data and voice at teacher work area outlet, multimedia equipment. These outlets provide the connection point to voice, data, and other media services.

DD. Exposed: Bare, open to the elements, out in the open, uncovered.

EE. Furnish: Purchase, supply, provide and deliver to the project site, protect and provide interim storage and be ready for unloading, unpacking, assembly, installation, and similar operations in accordance with Manufacturer's specifications."

FF. GE Grounding equalizer: Employed in a multistory building to interconnect multiple TBBs on the same floor. Sized equal to TBB.

GG. Horizontal Cabling: Cabling between and including the work area outlet/connector and the horizontal cross-connect/patch cord in the telecommunications room.

HH. Install: Describes operations at project site including the actual "unloading, unpacking, rigging in place, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".

II. Installer: Contractor, Subcontractor and/or supplier who uses their own employees for performance of all construction activity related to their specified responsibilities, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform and the "Installers" must be an authorized Manufacturers representative, certified, experienced and qualified to provide, install, program, troubleshoot, train, warrant and service all the systems in this section in their entirety.

JJ. If Applicable: That work which may be required for completed construction at applicable locations, but is not necessarily shown or described in the Contract Documents.

KK. Owner: Person or entity for which the building and construction is being done; and/or that will take possession of the property once the construction is complete.

LL. Owner Representative: The person or entity representing the Owner on contractual matters.

MM. Product: Any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.

NN. Provide: To "furnish and install, complete and ready for the intended use".

OO. RCDD: Registered Communications Distribution Designer (RCDD).

PP. Substantial Completion: The project is sufficiently complete to be utilized for its intended use as stated in the body of this written Specification.

QQ. TBB: Telecommunications Bonding Backbone

RR. TGB: Telecommunications Grounding Busbar

SS. TMGB: Telecommunications Main Grounding Busbar

TT. Words in the singular: Will also mean and include the plural, wherever the context so indicates, and words in the plural will mean the singular, wherever the context so indicates.

1.4 SUBMITTAL REQUIREMENTS

A. General
1. Provide required submittals in accordance with Conditions of the Contract, and Division 1 Submittal Procedures Section.
2. Format:
a. For this section furnish submittal data neatly bound in an 8 1/2" x 11" folder or binder for each specification section with a table of contents listing materials by Section and paragraph number.
b. Project name and address
c. Number of submittal
d. Name and address of the contractor
e. Date of submittal
f. Table of contents with material page numbers listed
g. Page number of the corresponding specification or drawing numbers in the contract documents.
3. Submittals to consist of:
a. Detailed shop drawings,
b. Product specifications,
c. Block wiring diagrams,
d. "Catalog cuts" and data sheets containing physical and dimensional information,
e. Performance data,
f. Electrical characteristics
g. Materials used in fabrication, and material finish.
4. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those which are excluded.

B. Material submittals
1. Label each submittal with the Specification Section Number and provide a cover letter or stamp stating that the submittal has been thoroughly reviewed by the Contractor and complies with the requirements of the Contract Documents. Failure to comply with this requirement will constitute grounds for rejection of data.
2. For each product, indicate where it is intended to be installed.
3. **Resubmittals**: Provide a cover letter with the resubmittal that lists the action taken and revisions made to each product submittal in response to Submittal Review Comments, ***indicating the page in the resubmittal that the new information occurs***. Failure to include this cover letter will constitute rejection of the resubmittal package and no review will occur.

C. Under the provisions of this request for proposal, prior to the start of work the Structured Cabling System Contractor will:
1. Submit copies of the certification of the company and names of staff that will be performing the installation and termination of the installation to provide proof of compliance of this spec.
2. Submit proof from Manufacturer of Contractor’s good standing in Manufacturer’s program where contractor is authorized by manufacturer to do warranted work.

3. Submit appropriate cut sheets and samples for all products, hardware and cabling.
4. Work will not proceed without the Owner's approval of the submitted items.
5. The Structured Cabling Systems Contractor will submit in writing any material substitutions they propose and receive approval from the Owners on all substitutions of material in writing prior to purchase and installation. No substituted materials will be installed except by written approval from the Owner.
6. Refer to other applicable sections for additional submittals requirements.

D. Submit a work plan for installation and testing of the structured cabling system, including time lines for milestones, coordination with other trades, etc.

E. Shop drawings
   1. Obtain electronic files containing the contract documents drawing files for use in preparing the shop drawings from the Engineer.
   2. Use of CAD Files: Should the Contractor need the Engineer's CAD files to produce shop drawings and/or as-built drawings, the Engineer requires the Contractor sign a CAD files release agreement.
   3. Submit the following for review and approval prior to the installation of equipment:
      a. Floor Plans: 1/8 inch scale floor and site plans showing the locations of devices and cable routing paths with cable types and quantity called out.
   4. Submit Shop drawings for the entire structured cabling system, identifying such items as rack fills, cabling pathways and pathway fills, ladder and other cable raceways, coordination with other trades, etc. These drawings and support narratives must completely describe the intended build for the project.

F. Provide Indexed Project Manual composed of Test Results, As-Built drawings, material cut sheets, maintenance instructions, Parts List (with part numbers) of all materials installed, etc., at the completion of project.

G. Certification letters from manufacturers of major system components stating the Contractor is an authorized reseller, installer, and extended warranty provider for the specified security systems.

H. Final close out documents including but not limited to bound indexed test results, project manual that includes such items as manufacturer and contractor warranties, product cut sheets, material submittals, etc.
   1. Provide Building Structured Cabling Systems Administration Report indicating TIA/EIA-606 required information.
   2. Hard copy documentation of test results for every cable segment and link in 3- ring binder. Documents will include measured values as well as whether or not the test passed.
   3. Provide "As-Built" Drawings on AutoCAD Version the same as provided by architect to the Owner. Obtain copy of original Drawings from the Architect.
      a. "As-Built" drawings indicating location of all equipment including but not limited to work area outlets, patch panels, cross connect blocks, on each segment and cable routing outlet and identifiers. Indicate labeling for each piece of equipment.
      b. Provide respective copies mounted in each telecommunications room, and the main cross connect.
      c. As-Built drawings will contain all installed cabling and materials. Outlets will be numbered with each cable associated with the work area outlet.
   4. Place a laminated ½ or full size floor plan of these drawing (coordinate with Owner) on the wall of each communications room.

I. Submit NRTL certification that the structured cabling system meets the transmission requirements of TIA-568-C.0.

1.5 QUALITY ASSURANCE

A. The Telecommunications Subcontractor shall have total responsibility for the coordination and installation of the work shown and described in the telecommunications drawings and specifications. The Telecommunications Subcontractor shall be a company specializing in the design, fabrication and installation of integrated telecommunications systems.

B. Telecommunications Systems specified shall be engineered, assembled and installed under the direction of a pre-qualified Telecommunications Subcontractor. Pre-qualification requirements shall include submittal by the Telecommunications Subcontractor to the Architect of the following:
   1. List of previous projects of this scope and nature, including names and sizes of projects (to include square footage and construction cost – overall and that of the Telecommunications Subcontractor), description of work, times of completion, and names of contact persons for reference.
   2. Installers shall certify that they are manufacturer-authorized or trained for work to be performed.

C. The Installer (Firm and Employees) will be experienced in the operations they are engaged to perform. Demonstrate at least five years of continuous recent experience on similar projects. The Installer will hold recent, up-to-date licenses, certifications and training certificates in the area the project is located and for the equipment to be installed.

D. Provide names of contacts from the last five similar projects including the General Contractor, Owner's Representative, Architect and Engineer. Indicate project locations, scope and current phone numbers that the contacts can be reached at.

E. Qualified Structured Cabling System Installation firms will have demonstrable design and installation training with certifications of competence. Certified training will be industry recognized and at least equal to:
   1. Building Industry Consulting Service International, Inc. (BISCI) Registered Installer.
   2. Registered Communications Distribution Designer (RCDD).
   3. Manufacturer Certified Installer

F. Provide a full time on site foreman who personally has been certified as described above. Submit all documentation under this Section.

G. Provide an on-call Project Manager to supervise the project.

H. Each Foreman and Installer working on this project will be trained to the qualified level as specified by the Manufacturer(s) for installation and maintenance of equipment being provided on this project. The training will consist of at least a minimum of proper installation techniques of their specific equipment in order to have a complete operating system meeting or exceeding the requirements as specified herein. Each Foreman and Installer working on this project will have documentation from the Manufacturer indicating that they have been adequately trained prior to the start of the project. Only Foreman and Installers who have been properly trained and documented by the Manufacturer whose equipment is being provided on this project will be allowed to install.

I. Separate Qualifications Requirements:

J. Installers will be specifically qualified for each system being installed under this section. Provide documentation for each installer including:
   1. State of CA License as required
   2. Registered Telecommunications Installer Apprentice Certificate

K. Maintain at the site an updated copy of the Manufacturer Trained Installers list including a copy of their training documentation from the Manufacturer. This documentation will be made available to the Architect upon request.

1.6 BIDDER QUALIFICATIONS

A. Bidding Contractor shall be licensed to install telecommunications systems in the state where work will be performed.

B. Bidding Contractor shall have a minimum of 5 years of experience installing structured cabling for telecommunications.

C. Bidding Contractor shall have the capability to bond project in its entirety.

D. Bidding Contractor shall be able to provide insurance at the request of the owner.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Contractor shall ensure that materials delivery to work area shall be coordinated with construction site manager responsible for materials distribution to all trades.

B. Contractor is responsible for all materials, tools and vehicles left on the job site.

C. Contractor shall coordinate a disposal bin for the removal of all trash produced by the Contractor’s associated personnel during the project.

D. Contractor shall ensure materials are stored in an environmental area where:
   1. Temperature does not exceed 120 degrees Fahrenheit nor below 32 degrees Fahrenheit.
   2. Humidity does not exceed 80%.
   3. No direct exposure to sunlight.

E. Cable shall be stored according to Manufacturer’s recommendations as a minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a heated (50 degrees F. minimum) location. If necessary, cable will be stored off site at the Contractor's expense.

F. Deliver equipment in individual shipping splits for ease of handling, mount on shipping skids and wrap for protection.

G. Inspect and report concealed damage to carrier within specified time.

H. Store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation. Meet the requirements and recommendations of NFPA 70B and the

Manufacturer. Location will be protected to prevent moisture from entering enclosures and material.

I. Handle in accordance with NEMA and the Manufacturer's recommendations and instructions to avoid damaging equipment, installed devices and finish.

J. The equipment will be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the Manufacturer will be required to brace the equipment suitably to insure that the tilting does not impair the functional integrity of the equipment.

1.8 PROJECT CONDITIONS

A. Environmental Requirements
   1. Contractor shall ensure that any pollutants produced during the work are disposed of according to local, state or national regulations. Follow the most stringent guidelines.
   2. It is preferred that the Communications Contractor recycle any used or un-used components during the course of the construction project.
   3. Coordinate with LEED project manager if cabling system or components will used for points in a LEED certified project.

B. Existing conditions
   1. Prior to bid, Telecommunications Subcontractor is to visit the existing building and evaluate all existing conditions. Bring to the attention of the Owner and Design Team any cause for concern or apparent conflicts with the contract documents as soon as practically possible.
   2. See Section 01 51 33 for Temporary Telecommunications requirements.

C. Field Measurements
   1. Contractor shall coordinate with electrical engineer on project that the main electrical service ground has a resistance to earth of less than 5 ohms.
   2. Contractor shall ensure that all grounding buss bars for all equipment network rooms shall have a resistance of less than 1 ohm back to the main electrical service ground.
   3. Contractor shall ensure that all field testers have been calibrated from the Manufacturer within 1 year.

1.9 PRE-CONSTRUCTION MEETING

A. If not called by GC contractor shall call a meeting with GC, Owner's representative, design consultant, and others deemed necessary by Owner &/or GC.

B. At the meeting, project schedule and phasing will be discussed. In addition, any constructability issues, or questions about the bid documents will be presented verbally and in writing. This is in addition to the standard RFI process established by project manual.

1.10 SEQUENCING

A. Contractor shall coordinate with Owner's project manager on sequencing of various trades and construction teams for the lifecycle of the project.

B. Cooperation and coordination with other trades.
   1. The work will be so performed that the progress of the entire building construction, including all other trades, will not be delayed and not interfered with. Materials and

apparatus will be installed as fast as conditions of the building will permit and must be installed promptly when and as directed.

2. Keep fully informed as to the shape, size and position of all openings required for all apparatus and give information in advance to build openings into the work. Furnish and set in place all sleeves, pockets, supports and incidentals.
3. Coordinate exact locations and roughing in dimensions of all work before installation and make all final connections as required. Any changes required to avoid interferences or to provide adequate clearances for Code and maintenance requirements will be made at no additional costs.
4. Structural elements of the project will not be relocated, altered or changed to accommodate the work without written authorization from the Owner/Architect.
5. Work that is installed before coordination with other trades or that causes interference with the work of other trades will be changed to correct condition at no additional cost to the Owner.
6. Obtain a complete set of Project Drawings and Specifications for coordination and to determine the full scope of work.
7. Attend project coordination meetings to coordinate work of this Section, pathways, work of other trades phasing and other project requirements.

1.11 CONTINUITY OF SERVICE AND SCHEDULING OF WORK

A. Contractor shall provide a detailed construction schedule with hard dates for completion of roughing in cables, terminations and testing once scheduling sequence has been determined to the Owner's Project Manager.

B. Cabling schedule shall be in a software program designated by the Owner's Project Manager.

C. Continuity of all services will be maintained in all areas that will be occupied or temporarily relocated during the construction period. If an interruption of service becomes necessary, such will be scheduled in advance, made only upon consent of the Owner and at a time outside normal working hours as the Owner will designate. The Contractor will schedule the shutdown with seven days in advance. Arrange work to minimize shutdown time.

D. Should services be inadvertently interrupted, immediately notify the Owner. Be prepared to immediately furnish labor, materials and the equipment necessary for prompt restoration of interrupted service.

E. Refer to the overall scheduling of the work of the project. Schedule work, process Submittals and order materials and equipment to conform to this schedule and install work to not delay nor interfere with the progress of the project.

F. Inform General Contractor and Architect immediately of any delays or potential delays. Furnish Manufacturer's letter to verify order date, equipment delays, expected shipment date, order number, and potential remedies to speed up delivery. Any costs to speed up delivery will be implemented at no cost to the project if the equipment or material was not ordered as soon as possible after Contract award or within the time frames indicated with the Submittals.

G. Include premium time required to comply with the project scheduling and phasing.

H. Be aware of, and plan for, project scheduling and phasing. Provide for complete continuous operation of all systems. Coordinate scheduling and phasing with the Architect, Owner, other Trades, and the General Contractor.

I. Demolition of existing systems being updated will take place only after the new or replacement system is completely installed, operational, tested and certified. This work may be required on a "per-phase" basis.

1.12 POST CONSTRUCTION MEETING

A. Subsequent to substantial completion and testing, contractor shall call a meeting with GC, Owner's representative, design consultant, and others deemed necessary by Owner &/or GC.

B. At the meeting, contractor shall present a DRAFT of AS-Built drawings, test results, and any other material contractor deems appropriate to completing the project for review by other attendees.

C. Any comments or requests for correction shall be noted by the contractor during the meeting. Corrections to all documents shall be made and final copies shall be submitted within 1 week of meeting.

1.13 PROTECTION OF WORK AND PROPERTY

A. Be responsible for the care and protection of all work included under this Section until it has been tested and accepted.

B. Protect all equipment and materials from damage from all causes including theft. All materials and equipment damaged or stolen will be replaced with equal material or equipment at the option of the Architect and Owner.

C. Materials and equipment stored for this project will be protected and maintained according to the Manufacturer's recommendations and requirements and according to the applicable requirements of NFPA 70B.

D. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen and make good any damage caused.

E. Use caution to avoid damage to existing work, and to prevent harm to personnel working in all areas.

F. Observe all safety precautions and requirements for the construction.

G. The General Contractor and the Installer are responsible for initiating, maintaining, and supervising all safety precautions and requirements during construction.

H. Coordinate installations with all other trades in order to not damage equipment or cables during construction. Any work that is damaged during construction will not be repaired. Replace damaged work completely, with no splices in cabling, at no additional cost to the Owner.

1.14 IDENTIFICATION AND LABELING

A. Label all major elements in communications infrastructure as defined in TIA 606B.

1.15 COMMISSIONING

A. WVMCCD District IS shall participate in the commissioning of the cabling infrastructure system. This will include a complete end-to-end test of the installed infrastructure, to ensure each jack and termination is functioning according to the specifications.

B. Notify District IS 2 weeks prior to testing / commissioning to ensure they can adequately staff the process.
   1. Request confirmation of receipt of commissioning notification.

PART 2 - PRODUCTS

2.1 REFER TO 27 05 26 FOR BONDING AND GROUNDING SPECIFICATIONS

2.2 REFER TO 27 11 00 FOR EQUIPMENT ROOM FITTINGS

2.3 REFER TO 27 13 00 FOR COMMUNICATIONS BACKBONE CABLING

2.4 REFER TO 27 15 00 FOR COMMUNICATIONS HORIZONTAL CABLING

2.5 REFER TO 27 16 00 FOR COMMUNICATIONS CONNECTING CORDS, DEVICES AND ADAPTERS

2.6 LABELING

A. Horizontal and grounding cabling: 1” white with black lettering. Dymo Rhino P/N 1734821
   1. Approved equal

B. Backbone cabling: 1” white nylon with black lettering: Dymo Rhino P/N 1734524
   1. Approved equal

C. Racks, patch panels, cabinets, fire stop systems: ½” white permanent polyester with black labeling. Dymo Rhino P/N 18483
   1. Approved equal

2.7 FIRE STOP

A. Fire stop sleeves must not only be UL listed for installed locations, but must also be design to stop the passage of smoke through the device, and by their design, reduce or mitigate the passage of sound through the device.
   1. Install fire stop systems that pass into lecture or other spaces that are rated. Ensure system maintains partition’s fire and STC rating, while not de-rating or changing the sleeves’ UL Listing.

B. Acceptable Manufacturers: Subject to compliance with requirements, provide products from manufacturers or approved equal as further defined in the Systems and Applications Schedule in Part 3 of this section.
   1. Hilti
   2. EZpath
   3. 3M

2.8 CABLE PROTECTION - METAL STUD-PUNCH BUSHINGS

A. Acceptable Manufacturer
   1. Greenlee, 721A
   2. Approved alternate

2.9 CABLE TRAY – ALUMINUM SOLID BOTTOM

A. Acceptable manufacturer: Cooper, or approved alternate
   1. KwikSplice solid bottom, P/N: KSB5A & KSB6A
   2. Utilize 5A for 6" wide, and 6A for 12" wide trays

B. Provide minimum of 1 divider for all tray, adding dividers as needed.
   1. Coordinate with other LVT trades for cable that may be placed in tray to allocate tray space for each.

~~2.9~~2.10 FLOOR BOXES

A. Minimum requirements:
   1. Sized to terminate Cat 6A data termination ports and power outlets as indicated on plans.
   2. UL listed for scrub water test and 2-~~—~~hour fire rating while maintaining fire classification of floors.
   3. Refer to electrical for box specs.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify the exact location prior to bid of all items that may be indicated and determine exact location of all electrical items that are not indicated on the Drawings.

B. Include the cost of all work including sub-letting of any work that may be required to complete the work indicated in order to avoid work stoppages and jurisdictional disputes. The work to be sublet will conform to precedent agreements and decisions of record. Jurisdictional assignment will be a responsibility under this Section's contractual obligation.

C. Do not install equipment and materials that have not been reviewed by the Architect. Equipment and materials which are installed without the Architect's review or without complying to comments issued with the review will be removed from the project when so instructed by the Architect. No payment will be made for unapproved or removal if it is ordered removed. The Installer will be responsible for any ancillary costs incurred because of its removal and the installation of the correct equipment and materials.

D. Obtain detailed information on installation requirements from the Manufacturers of all equipment to be furnished, installed or provided. At the start of construction, check all Contract Documents, including all Drawings and all Sections of the specifications for equipment requiring electrical connections and service and verify electrical characteristics of equipment prior to roughing.

E. Equipment and systems will not be installed without first coordinating the location and installation of equipment and systems with the General Contractor and all other Trades.

F. Any and all material installed or work performed in violation of above requirements will be re-adjusted and corrected by the Installer without charge.

G. Refer to all Drawings associated with the project, prior to the installation or roughing-in of the electrical outlets, conduit and equipment, to determine the exact location of all outlets.

H. Label all equipment as herein specified.

I. After installation, equipment will be protected to prevent damage during the construction period. Openings in conduits and boxes will be closed to prevent the entrance of foreign materials.

J. Home runs indicated are not to be combined or reduced without written consent from the Architect.

K. All connections to equipment will be made as required, if applicable, and in accordance with the approved submittal and setting drawings.

L. Site Observation:
   1. Site observation visits will be performed randomly during the project by the Architect. Reports will be generated noting observations. Deficiencies noted on the site visit reports will be corrected. All work will comply with the Contract Documents, applicable Codes, regulations and local Authorities whether or not a particular deficiency has been noted in a site visit report.
   2. Be responsible to notify the Architect ten working days prior to closing in work behind walls, raised access floors, ceilings, etc., so that installed work can be observed prior to being concealed.
   3. Areas will stay accessible until deficiencies are corrected and accepted. Notify the Architect when all deficiencies are corrected. Return reports with items indicated as corrected prior to re-observation by the Architect.

M. Change Orders, Modifications, Revisions and Directives:
   1. When change orders, modifications, revisions or Architect's Directives are issued or authorized, provide the required additional material, equipment, personnel and workers to prevent delays in the work, and to complete the work within the time limit of the Contract unless a specific time extension is requested with the change and accepted. Include costs for expediting deliveries where required.
   2. Requests for additional compensation will be submitted broken down and associated by item, tasks and Drawing or sketch number with material and labor costs, so quantities can be easily verified.
   3. Requests will be properly and adequately identified so the scope of work can be clearly determined. Indicate who originated change in work.
   4. Submit on all credits broken down as requested for adds. Credits will be separately identified and accounted for. Do not indicate as net changes with adds.
   5. Unit costs for labor and material will be equal for adds, deletes and credits.

N. Loose materials will not be stored on-site. A "gang box" is acceptable to be placed in a location agreeable to the Owner and the General Contractor. The Installer is responsible for all equipment and materials and for their delivery until the system is deemed complete and accepted by the Owner.

O. A trailer may be used for the storage of materials to be located on the Owner's property at a location designated by the Owner and the General Contractor. Such on-site storage will

be kept locked by the Installer. Security for the trailer and its contents will be strictly the responsibility of the Installer.

P. Protect existing spaces where work is being performed; protect it from damage and from the accumulation of dirt and debris.

Q. Any ceilings, walls, floors, furniture, equipment, furnishings, etc., damaged by the work of this Section will be replaced, or at the Owner's option, repaired with similar materials, workmanship and quality.

R. Work includes field survey of existing conditions, systems, equipment and tracing of existing circuits in order to determine scope of work.

S. Maintain the existing building in operation at all times during the entire construction period. If it is necessary to have a system shutdown, a written request for approval will be submitted in advance stating the estimated shutdown time. Work will be planned to minimize shutdown. Shutdowns will be at the convenience of the Owner and, if necessary, on premium time.

T. Clean and touch up all equipment, materials and work sites at the completion of work in each area.

U. Certain portions of the work area may be occupied during construction. Determine which areas and schedule work accordingly and include necessary premium time.

V. Make sure necessary provisions to provide continuous service of all existing systems throughout all occupied areas.

3.2 CABLE PATHWAYS

A. Install cables in pathways designed to support the cables per manufacturer instructions.

B. Provide all equipment and cabling for a complete installed operating system. Cable tray pathways, outlet boxes and grounding are provided by the Electrical Subcontractor unless otherwise noted.

C. All pathways provided under this Section will comply with fill capacities as per Code, TIA/EIA 569 and BICSI. Coordinate with electrical contractor prior to pathway installation to verify capacity.

D. Cable bending radius will not be less than minimum required by TIA/EIA and BICSI.

E. Cabling installed concealed will be supported from the building structure (e.g. cable trays, J-Hooks, etc.).

F. Cables will be installed no closer than 12 inches (305mm) to electrical equipment and wiring. When cables are required to cross power wiring, they will only do so perpendicular to the power wiring. Cable and power wiring will only cross each other the minimal number of times as required due to building design limitations.

G. Clearances: Clearances between cabling and other building systems as required by TIA/EIA 569 and BICSI will be maintained throughout the building.

H. All cables will be installed in a neat and workman-like manner. Cables will be installed parallel and perpendicular to building elements.

I. Provide expansion fittings and adequate cable slack at all building expansion joints.

J. Fire/smoke seal around all conduits, raceways, sleeves, slots, etc. where cables pass from one location to another.

3.3 FLOOR BOXES

A. Refer to electrical.

B. Coordinate with electrical contractor for conduit routing to TR prior to boxes installation.

3.4 WORK AREA OUTLETS

A. All work area outlet locations will be as indicated on the Drawings. Uniquely label each work area outlet and jack within the outlet according to the numbering convention outlined in the section on labeling.

B. Labeling shall be sequential in order, do not reuse a number throughout the entire infrastructure.

C. Work area outlets installed in casework will have their cables installed within the conduit or raceway provided.

D. Install jack and connector modules as indicated in the details and on the Drawings.

E. Work area outlets will be seated properly and will be installed level on walls and parallel to building elements as required.

3.5 INSTALLATION PRACTICES

A. Follow and adhere to installation practices specified by the applicable Telecommunications Industry Association standards.

B. Follow and adhere to installation practices specified by BICSI Information Transport System Installation Manual 5th Edition.

C. Follow and adhere to installation practices specified by BICSI Telecommunications Distribution Methods Manual 11th Edition.

D. Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008.

E. Follow and adhere to installation practices specified by the Manufacturers.

F. The general topology will be a "hierarchal star" configuration. All segments will originate in NRTL listed patch panels located in the telecommunication equipment racks/cabinets and end at the work area outlets.
   1. Routing:
      a. All cabling will be installed in conduit.
      b. Cables will be routed, in large groups, down main cable pathways, until a direct path to the point of access to the workstation outlet can be taken. At that point,

cables will be routed, above all building systems, to the outlet location in accordance with standard installation practices, as described herein.

c. Multiple cables to individual rooms will be pulled as a bundle and terminated at each end in sequential order so that labeling within a room location is in sequence.
d. When not in conduit or tray, cables will be supported to the deck and/or beams, per Part 310 this specification. Hangers, clips, and other methods of grouping the cables and keeping them away from other systems installed in the building are to be provided and installed. Ensure that hangers and other methods of securing cable do not compress cable or damage insulation.
e. Cables hanger will be attached to beams prior to fire proofing applications and with minimal disruption of the fireproofing. The Contractor will be responsible for restoring the fireproofing to appropriate levels. Restoration will be verified by the General Contractor. Provide documentation that installation or restoration of fire stop systems is acceptable to Owner and PM.
f. Cable routes will be with 90-degree angles whenever possible, following building lines. Cables will not be installed randomly or diagonally through the building.
g. Cables installed partially or fully within the telecommunications room will be routed through and secured in the cable tray wherever possible. No cables are to be routed across the rooms at angles, or are the cables to be run from one portion of the room or tray to another. Cables placed in the cable tray are to be laced frequently to keep them neatly bundled and not permitted to shift from one side of the tray to the other as they are routed in the tray.
h. Station cables will be routed to fixed wall locations through EMT to back box. Secure and store four feet of slack cable above ceiling at cable entrance to EMT.

2. Separation from EMI Sources:
   a. Comply with BICSI TDMM and TIA-569-C recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
   b. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment will be as follows:
   c. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
   d. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
   e. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).
   f. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment will be as follows:
   g. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
   h. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
   i. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
   j. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures will be as follows:
   k. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   l. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
   m. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

n. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
o. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3. All cables will have both ends completely terminated at their respective patch panel and work area outlet. Individual conductors will be trimmed flush with IDC block.
4. The total length of permanently installed cable for any complete segment will not exceed 295 feet (90m). Do not splice or otherwise re-terminate any cable used, terminate only at the patch panels, cross connect blocks and work area outlets. Route cables [minimum of 12 inches (305mm) away] to avoid light ballasts, transformers, power wiring and other electrical devices so that there is no EMI or RFI interference with data transmission. Permanently label all cables six inches from the connector at each end, according to the numbering convention outlined in the section on labeling. All cables will be terminated at outlets, patch panels or cross-connect blocks ONLY.
5. Maximum pulling tension will not exceed 25 lbs./ft. when installing cables.

3.6 LABELING

A. Document and place on full and half size set of plans all elements with their unique numbers.

B. All cables will be labeled according to the guidelines as set forth in the EIA/TIA 606-B standard. This shall include:
1. The origination point
2. The destination point
3. The type of cable (SMF, 50MMF)
4. The pair or fiber strand count

C. Provide a definition or labeling matrix with As-Built/Document Close-Out submittals that defines each labeling element with examples of each field defined.

D. Submit complete labeling scheme for all elements with initial submittals for project.

E. Confirm with Owner prior to implementation, the proposed labeling scheme you are intending to implement.

F. Ensure labeling for backbone cables includes information on the space name/number of the cable's opposite end. This requirement includes buss bar, bonding conductor, and bonding backbone cable labeling.

G. As a part of the close-out submittal package, provide riser cable and bonding conductors drawings (full and half size as well as editable soft copy) showing the cables, their installed routes, and the cable numbers. These documents will be in addition to the As-Built floor plan submittals that identify work area outlet placement with their respective identification numbers.

H. The Contractor shall confirm specific labeling requirements with the Owner or Owner's Representative prior to cable installation or termination.

I. Horizontal cables shall be marked at each end, on the sheath indicating the Telecommunications Room and jack number to which the cable is wired.

J. Backbone cables shall be marked at each endpoint and at all intermediate pull/ access points or junction boxes. Label shall indicate origination and destination Telecommunication Rooms, sheath ID and strand or pair range.

K. Meet the legibility, defacement, exposure and adhesion requirements of UL 969.

L. Be pre-printed or laser printed type.

M. Where used for cable marking, a label with a vinyl substrate and white printing area and a clear "tail" that self laminates the printed area when wrapped around the cable shall be provided. The label color shall be different than that of the cable to which it is attached.

N. Where insert type labels are used, provide clear plastic covers to go over label.

O. Telecommunications Room Naming
   1. Each Telecommunications Room will be named and numbered with an individual numeric identifier. The number is assigned by WVMCCD District IS

P. Fiber Backbone Cable Labels
   1. All backbone fiber cables (riser cables) will be labeled at each end of the cable bundle at the furthest point where the sheath is intact (before breakout). If the riser cables pass through multiple pull boxes,
   2. Telecommunications rooms and riser openings, they will be labeled at each opening.
   3. All outside plant backbone fiber cables will be labeled at each end and in each handhole/maintenance hole that they pass through. Labels will be heat and water-proof so they do not decay when exposed to the elements. All labels must be visible at point of access.

Q. Labels will be color-coded according to purpose.
   1. Fire Alarm – RED
   2. Data – YELLOW
   3. AV – WHITE OR GREY

R. Optical Fiber Patch Panel Labels
   1. Fiber patch panels shall be marked using adhesive labels indicating the range of fibers installed in it. Each panel shall be labeled with the origination and destination Telecommunication Spaces and the strand count. Each fiber strand shall be labeled with a unique strand ID.
   2. All fiber patch panels will be labeled according to the guidelines as set forth in the EIA/TIA 606-B standard. This shall include:
      a. Name of source Telecommunications room
      b. Name of destination Telecommunications room
      c. Fiber pair number
      d. Riser/Backbone Copper Cable Labels

S. All outside plant backbone copper cables will be labeled at each end and in each handhole/maintenance hole that they pass through. Labels will be heat and water-proof so they do not decay when exposed to the elements. All labels must be visible at every point of access.

T. Copper Protector Labels
   1. Copper protectors shall be marked using adhesive labels indicating the range of copper backbone pairs installed in it. Each panel shall be labeled with the origination and destination Telecommunication Spaces and the pair count.

2. All protectors will be labeled according to the guidelines as set forth in the EIA/TIA 606-A standard. This shall include:
   a. The origination point
   b. The destination point
   c. The type of cable
   d. The pair count
3. Where protectors terminate multiple backbone pairs, each backbone will be clearly and discretely labeled.

U. Faceplate/Outlet Labels

V. All faceplates/outlets for station cable terminations will be labeled. This includes wall outlets, wall phones, faceplates in floor boxes and all other termination points. For faceplates equipped with a label trough and plastic cover, the Contractor shall include the jack designation in the label trough.

W. If upper and lower troughs are available, the Contractor shall divide the jack labeling horizontally, labeling the top two jacks in the upper trough and the bottom two jacks in the lower trough.

X. All faceplates/outlets will be labeled according to the following guidelines:
   1. Name of Telecommunication Space the cable routes to.
   2. Unique faceplate/outlet number, incrementing numerically.

Y. Station Cable Labels
   1. Each jack will be labeled for each pair in the riser/backbone cable.
   2. All station cables will be labeled at each end of the cable within 6 inches of the termination. At the patch panel end, all labels must be visible and not be placed inside wire management. Station cables will also be labeled on the faceplate.
   3. All cables will be labeled according to the guidelines as follows:
      a. Name of the Telecommunications room where the cables terminate.
      b. Faceplate/outlet number
      c. Jack Type – V for voice and D for data
      d. Jack label –numeric (1,2) labeled left to right.

Z. Copper Patch Panel Labels
   1. All ports on the station patch panels shall be labeled with the station cable labels described above. Cables will be terminated in ascending outlet and jack order, and be so labeled.
   2. Patch panels which provide cabling connection to voice riser and backbone pairs shall be labeled using a similar convention as the backbone/riser cable labeling. The patch panel will be labeled with the cable name including:
      a. The origination point
      b. The destination point
      c. The type of cable

AA. Labeling procedure will meet EIA/TIA 568C, 606-B (Class 2 Administration) and BICSI Standards.

BB. The labeling scheme will be provided as follows at all locations within the cable infrastructure:
   1. Location identification will start from the left, as you walk in the doorway, and continue around the room in a clockwise direction.

2. Data drops will be labeled with the room number and sequential letters; starting with 'A' (e.g. the first three data drops in Room 201 would be labeled 201A, 201B and 201C). Skip the letter 'V'.
3. Voice drops will be labeled with the room number and the letter 'V' (e.g. the telephone drop in Room 128 would be 128V).
4. Labeling shall be sequential in order, do not reuse a number throughout the entire infrastructure.
5. Hand-written and embossed type labels are specifically prohibited. In addition, provide the following:
   a. Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters.
   b. Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in the following locations:
   c. Inside receptacle box at the work area.
   d. Behind the communication room patch panel or punch block.
   e. Use labels on face of data patch panels. Provide facility assignment records in a protective cover at each telecommunications room location that is specific to the facilities terminated therein.
   f. Use color-coded labels for each termination field that conforms to ANSI/TIA/EIA-606(A) standard color codes for termination blocks.
   g. Mount termination blocks on color-coded backboards.
   h. Labels will be machine-printed. Hand-lettered labels will not be acceptable.
   i. Use industry standard EIA/TIA and BICSI color codes as specified herein and maintain consistent color-coding throughout the building.

3.7 FIRE STOPPING

A. Work, in general, includes furnishing and installing fire and smoke barrier penetration seals for openings in floor, walls, and other elements of construction.

B. Comply with requirements in Division 07 Section "Penetration Fire stopping".

C. Comply with TIA/EIA-569-A, Annex A, "Fire stopping."

D. Comply with BICSI TDMM, "Fire stopping Systems" Article.

E. Applicator Qualifications: Two years of experience installing UL classified fire stopping.

F. Performance of materials will have been tested to provide fire rating equal to that of the construction.

3.8 SHOP DRAWINGS:

A. Submit complete shop drawings coordinated where required with work of other sections.
   1. Shop drawings shall show layout, spacing, sizes, thicknesses, and types of fabrication, fastening and anchorage details, including welded connections and mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachments to other units or Work, and other details required for proper installation.

B. Submit shop drawings showing each condition requiring penetration seals indicating proposed UL systems materials, anchorage, methods of installation, and actual adjacent construction.

C. Include details of cuts, connections, splices, bridging, accessories and other pertinent data required for a complete and proper installation.

D. Include items not shown and special components and installations not fully dimensioned or detailed in manufacturer's product data.

E. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

F. Provide setting diagrams, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.

G. Submit a copy of UL illustration of each proposed system indicating Manufacturer approved modifications.

H. Manufacturer's Data: Submit copies of Manufacturer's specifications, recommendations, installation instructions, and maintenance data for each type of material required. Include letter indicating that each material complies with the requirements and is recommended for the applications shown.

I. Provide stamped drawings and structural calculations signed by a structural engineer registered in the State of installation. Provide calculations for loading and stresses of specially fabricated, designed framing. Clearly indicate all loads imposed on primary building structure.

J. Existing Project Conditions:
   1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
   2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

K. Materials:
   1. Provide materials classified by UL to provide for intended use. For Fire Barriers it must be equal to time rating of construction being penetrated.
   2. Provide asbestos free materials that comply with applicable codes and have been tested in accordance with UL 1479 or ASTM E-814.

L. Preparation: Clean surfaces to be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

M. Installation:
   1. Install penetration seal materials in accordance with printed instructions of the UL Building Materials Directory and in accordance with Manufacturer's instructions.
   2. Seal holes or voids made by penetration to ensure an effective smoke barrier.
   3. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install fire stopping materials capable of supporting same loading as floor.
   4. Protect materials from damage on surfaces subject to traffic.

N. Field Quality Control:
   1. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
   2. Keep areas of work accessible until inspection by applicable code authorities.

3. Perform under this section patching and repairing of fire stopping caused by cutting or penetration by other trades.

O. Adjusting and Cleaning:
1. Clean up spills of liquid components.
2. Neatly cut and trim materials as required.
3. Remove equipment, materials and debris, leaving area in undamaged clean condition.

P. Environmental Requirements:
1. Furnish adequate ventilation if using solvent.
2. Furnish forced air ventilation during installation if required by Manufacturer.
3. Keep flammable materials away from sparks or flame.
4. Provide masking and drop cloths to prevent contamination of adjacent surfaces by fire stopping materials.

3.9 SEALING OF PENETRATIONS AND OPENINGS

A. Where partition penetration does not require a rated assembly, provide penetrations that maintain partitions' acoustical rating.

B. All fire stop systems will be installed in accordance with the Manufacturer's recommendations and will be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.

C. Where possible, utilize fire stop systems that have intumescent material built in as a part of the system.

D. Where systems with built in intumescent material are not provided, provide a seal around raceways or cables penetrating full height walls (slab to slab), floors or ventilation or air handling ducts so that the spread of fire or products of combustion will not be substantially increased, and that also maintains partition's STC rating.

E. Penetrations through fire-resistant-rated walls, partitions, floors or ceilings will be fire stopped using approved systems and methods and NRTL listed products to maintain the fire resistance rating.

F. Installation restrictions of the listing agencies will be strictly adhered to {e.g. 24 inch (610 mm) minimum horizontal separation between boxes on opposite sides of the wall, maximum square inch opening in wall}.

G. Fire stopping in sleeves or in areas having small openings that may require the addition or modification of installed cables or raceways will be soft, pliable, non-hardening fire stop putty. Putty will be water resistant and intumescent.

H. Fire stopping in locations not likely to require frequent modification will be NRTL listed putty or caulk to meet the required fire resistance rating.

I. Box penetrations into a fire rated wall or shaft will have a fire-stopping pad installed on the back of the box.

J. Fire stopping of cable trays through walls will be with NRTL listed intumescent bricks to meet the required fire resistive rating and that will not allow products of combustion to

pass through the protected opening. The NRTL listed bags will be installed inside and on both sides of the opening as required to meet the required resistive fire rating of the wall.

K. Fire stopping materials will be NRTL listed to UL 1479 (ASTM E814). Installation methods will conform to a UL fire stopping system. Submit specifications and installation drawings for the type of material to be used. Fire stopping materials will be as manufactured by 3M, International Protective Coatings Corp., Specified Technologies, Inc., Carborundum Company, RayChem, Nelson Fire Stop or approved equal.

3.10 WARRANTY REQUIREMENTS

A. Project Warranty
   1. Equipment and materials required for installation under these specifications shall be the current model and new (less than one [1] year from date of manufacture), unused and without blemish or defect, and are to be guaranteed to be free from defect for a minimum of one year from date of project's substantial completion.
   2. When a defect or problem is observed within the first year after substantial completion, the Owner will notify the governing subcontractor through the proper channels. The appropriate Subcontractor then has 48 hours to fix the defect or furnish and install a replacement part/system, all at no cost to the project or Owner.

B. Advanced System Warranty for Telecommunications (Copper and Fiber Systems)
   1. Beyond the initial one year project warranty, the Copper and Fiber Telecommunications Systems shall be warrantied for a minimum of 15 years by a national and reputable connectivity or cabling manufacturer.
      a. This warranty shall to cover any material defect, as well as the performance of the cabling system. (Example: A Category 5e cabling system is to deliver 1000BASE-T speed, or 1 "Gig" performance for the entire length of the warranty period.)
      b. This warranty shall cover both material and labor for the full length of the warranty period.
   2. Submit copies of written warranty, minimum of one year, agreeing to repair or replace joint sealers which fail in joint adhesion, cohesion, abrasion residence, weather resistance, extrusion residence, migration residence, stain resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted Manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period will be one year from date of substantial completion.
      a. The Telecommunications Subcontract shall be certified by this manufacturer.
      b. The following manufacturers are conditionally approved to provide the system warranties (subject to specific project requirements):
         1) Copper Connectivity Manufacturers
            Systimax
            Approved alternate
         2) Fiber Connectivity Manufacturers
            Systimax
            Approved alternate
         3) Cabling Manufacturers
            Systimax
            Approved alternate

3.11 CABLE SUPPORTS

A. Provide hook and loop (Velcro) cable wraps at all panels, equipment racks, cabinets and J-hook supports. Tie wraps are specifically prohibited.

B. For horizontal cables, secure with minimum required compression in order to secure the cables properly without impeding the signal transmission rating (geometry) of the cable. Hook and loop (Velcro) cable wraps may be used in lieu of cable ties for copper cables only.

C. Provide J-Hook supports from the building structure as required for cable runs to the cable drop location. Maximum distance between supports will be from 3.5 to 5.5 feet (with spacing randomly determined) depending on the structural elements of the building. Comply with maximum number of cables per support specified by manufacturer. Provide additional supports as required when cable quantities exceed manufacturer's data, and to maintain required bending radius of cables. Cables installed exposed or in areas subject to abuse {below 10 feet (3m) above finished floor} or in accessible areas will be installed in conduit.

D. All cables will be supported directly from building structure. Under no circumstance will cable be installed using cross bracing, plumbing/sprinkler pipes, ceiling systems or any other system that is not a specifically approved method to independently support cables. Cables will not be allowed to rest on ceiling tiles, duct work, piping, etc. Supports will be provided as required in order for cables to avoid contact with any other building system. Bundle cables in groups by Room.

3.12 CABLE PROTECTION

A. Provide bushings in all metal studs and the like where cables will pass through. Bushings will be of two (2)-piece construction with one piece inserted through the opening and the second piece locking it into place. Single piece bushings with locking tabs or friction fit are specifically prohibited.

B. Cables to be installed in existing enclosed open bays or furred spaces where conduit stubs are not provided, will be protected from chafing or any damage. The Installer will verify that the warranty will not be violated before installing any cabling in these locations.

C. Provide cutting, coring, sleeves and bushings and seal as required at all penetrations.

D. Cables damaged during installation will not be repaired. They will be completely replaced with new cable at no cost to the Owner.

3.13 GROUNDING & BONDING

A. Refer to section 27 05 26 for Grounding and Bonding requirements.

3.14 DOCUMENTATION

A. Label all equipment as herein specified.

B. Provide:
   1. Provide Building Structured Cabling Systems Administration Report indicating TIA/EIA-606 required information.
   2. Hard copy documentation of test results for every cable segment and link in 3- ring binder. Documents will include measured values as well as whether or not the test passed.
   3. "Record" drawings indicating location of all equipment including but not limited to work area outlets, patch panels, cross connect blocks, on each segment and cable routing. Indicate labeling for each piece of equipment.

4. Record drawings indicating actual cable routes and outlet identifiers. Provide respective copies mounted in each telecommunications room, and the main cross connect.

C. Provide "as-built" Drawings on AutoCAD Version 12 or higher to the Owner. Obtain copy of original Drawings from the Architect.

D. Submit NRTL certification that the structured cabling system meets the transmission requirements of TIA-568-C.0.

3.15 TRAINING

A. The appropriate Telecommunications Subcontractor shall be responsible for training of facility personnel in accordance with requirements of this Section and Division.

B. Training shall take place within 2 weeks after substantial completion and shall include programs for on-site operations and maintenance of telecommunications and audio/video systems. Training shall be for not more than ten people, shall be held at the Owner's site, and shall be of sufficient duration and depth to ensure that the trained personnel can operate the installed systems and can perform usual and customary maintenance actions.

C. As a minimum training sessions will consist of the following:
   1. General project information and review will be by the General Foreman or Superintendent of the Trade.
   2. Specific system training will be by a Factory Trained Representative.
   3. Provide a complete review of the project and systems including, but not limited to, the following:
      a. Review each As-Built Drawing (use of typicals is acceptable).
      b. Note equipment layouts, locations and control points.
      c. Review each system.
      d. Review system design operation and philosophy.
      e. Review areas served by equipment.
      f. Identify color codes used.
      g. Review features and special functions.
      h. Review maintenance requirements.
      i. Review operation and maintenance manuals.
      j. Respond to questions (record questions and answers).
   4. After training, walk the entire project, review each equipment room and typical locations. Explain equipment and proper operation.

D. During the instruction period the Owner and Maintenance Manual will be used and explained.

E. The Owner and Maintenance Manual material will be bound in 3-ring binders and indexed. On the edge of the binder provide a clear see-through plastic holder with a typed card indicating the Project name, the Architect's name, the installer's name and the Volume number (e.g., Vol. No.1 of 2).

F. Provide name, address and telephone number of the Manufacturer’s representative and Service Company for all items supplied so that the source of replacement parts and service can be readily obtained.
   1. Include copies of Manufacturer’s and installer's warranties and maintenance contracts and performance bonds properly executed and signed by an authorized representative.

2. Include copies of all test reports and certifications.

3.16 CLEANING

A. In all telecom room spaces - a thorough sweeping, vacuuming and wet mopping shall be performed on a weekly basis or more frequently as directed by the owner. Cleaning shall include floors, rafters, floor joists, exposed structural members, exposed mechanical/electrical equipment and ductwork/piping/conduits, walls, ladder trays, tops of cabinets/racks, existing/new passive and active components, or per manufacturer recommendations.

B. All cable managers and snap covers shall be wiped clean, both inside and outside of front, including rear channels. All clear covers and doors shall be cleaned, both front and rear per manufacturer recommendations.

C. Inside of fiber optic enclosure and patch panels shall be blown clean of settled dust. Cleaning shall be performed for all new construction projects or where gypsum sanding has been performed.

D. NOTE: During installation and prior to final handoff to Owner, keep all open fiber and copper ports covered utilizing plastic or tape that leaves no sticky residual.

E. All scraps, boxes, spools, pull-line and trash shall be removed and properly disposed of.

F. All residual cable lubricant shall be cleaned from floors and walls with an appropriate degreaser.

3.17 PROJECT CLOSEOUT

A. Provide close out submittals as required herein and include the following close out submittals.
   1. Operation and Maintenance Manuals
   2. Record Drawings
   3. Test Reports
   4. Warranty certification from Manufacturer’s
   5. Extra Materials
   6. Provide factory calibration report of field test equipment

B. Obtain written receipts of acceptance close out submittals submitted. Receipts will specifically detail what is being delivered (description, quantity and specification section) and will be dated and signed by firm delivering materials and by the Owner's Representative.

C. Provide As-Built drawings indicating actual cable routing and cable terminations including all required identifiers.

D. Provide a half size laminated set of drawings mounted in the Main Equipment Room.

E. All sketches, drawings, and charts herein are for the purpose of providing for specifications in a simplified format. Errors and omissions in such do not relieve the Contractor of the responsibility for providing a fully complete, secure and properly operating structured cabling system suitable for the intended use. Bidders must obtain a complete set of Project Drawings and Specifications to determine the full scope of work. In case of conflict, the Project Drawings and Specifications will prevail.

END OF SECTION

SECTION 27 1500 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes information on horizontal communications cabling supplementing requirements found in the related sections.

B. Related Sections
1. 270000: Communications
2. 270526: Grounding and Bonding of Communication Systems
3. 270536: Communication Cable Pathways
4. 270810: Optical Fiber Testing and Measurement
5. 270820: Copper Testing
6. 271100: Communications Equipment Room Fittings
7. 271300: Communications Backbone Cabling
8. 271600: Communications Connecting Cords Devices & Adapters

1.2 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

A. Conduit and EMT required for Communications cabling pathway in/out of cross connect closets and in/out of wall cavities at the work area where ceiling is inaccessible.

B. Rings (and strings) with conduit connecting tabs for the mounting of NEMA rated faceplates where required.

C. Drag line or pull string at the ring fished through EMT or conduit to the other end for installing 4 pair and multi-pair cables.

1.3 SYSTEMS DESCRIPTION

A. Horizontal copper cabling system consists of rated cables with four unshielded twisted pairs of solid annealed copper wrapped in plenum rated insulation with an overall plenum rated jacket with a wire thickness of 23 AWG. Each four pair cable is terminated onto 8 position 8 conductor rated connectors using 110 style IDCs. Connectors are placed into NEMA rated faceplates at the work area and placed into rack mounted patching panels in the equipment / networking rooms.

B. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
1. TIA-568-C.0 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling will contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices will not be installed in the horizontal cabling.
   a. A work area is approximately 100 sq. ft. (9.3 sq. m), and includes the components that extend from the telecommunications outlet/connectors to the station equipment.
   b. The maximum allowable horizontal cable length is 290 feet. This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment. The maximum allowable length does not include an allowance for the length of 18 feet in the horizontal cross-connect.

1.4 MANUFACTURER QUALIFICATIONS

A. Manufacturer shall be a telecommunications product manufacturer with at least 20 years of experience.

B. Manufacturer shall be ISO 9001 certified manufacturer and shall employ Six Sigma methodology in its manufacturing process.

1.5 TESTING AGENCY QUALIFICATIONS

A. Independent testing agencies shall be nationally recognized as having the expertise to independently verify copper and optical fiber cabling systems and components.

B. Testing Agency Qualifications: Must be a NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-C.

E. Grounding: Comply with ANSI-J-STD-607-B.

1.6 WARRANTY

A. Contractor shall provide a 1 year parts and labor warranty against defective workmanship and/or system component failure.

B. Contractor shall execute a Lifetime Applications Assurance Warranty for parts and labor to support stated applications from the connectivity Manufacturer.

C. As further described below, the “Supplier” shall warrant to the customer (“Buyer”) that the CAT 6 certified network installations will exceed the defined TIA 568 series industry specifications in force at the time of product purchase. Furthermore, the products that comprise the certified Cabling System will meet or exceed the applicable product performance specifications in effect at the time of manufacture.

D. This warranty covers the copper and fiber optic permanent links of the network as defined by TIA-568-C.0 which includes the cable and connecting hardware. This warranty will be extended to include the entire channel provided that the applicable patch cords and equipment cords are utilized, and all products are installed within areas protected from outside elements.

PART 2 - PRODUCTS

2.1 GENERAL

A. The Electrical Code referred to in these specifications is the National Electrical Code as currently adopted by the State of CA. All work will be provided in strict compliance with the Electrical Code and all regulations that may apply.

~~A.~~B. Where standards exist, for a particular category, products used on this project will be listed by an OSHA approved Nationally Recognized Testing Laboratory (NRTL), and be approved or listed for the intended service and application.

~~B.~~C. These specifications do not undertake to repeat the requirements of codes, regulations or NRTL listing or labeling instructions. The Specifications or Drawings may require items or work beyond the requirements of applicable codes or regulations. The stricter, higher quality, greater quantity or higher cost will be provided. It is incumbent on the Installer, material and equipment suppliers to meet these specifications, applicable codes, regulations, and NRTL listing agency restrictions.

2.2 MANUFACTURER

A. The word "Manufacturer" will include the Manufacturer, the Manufacturer's Representative, the Distributor, the Fabricator, and the Supplier of the particular classification of equipment, system, product, and material.

B. All work, equipment, and systems will be manufactured, provided, repaired, installed, and tested in accordance with the latest edition and all current amendments of the applicable publications and standards of the organizations listed below as of the date of the Contract Documents. When the Specification requirements exceed the requirements of these publications and standards the Specifications will govern:
   1. State Building Code (SBC)
   2. Building Department Inspectional Services
   3. American Society for Testing and Materials (ASTM)
   4. Underwriter's Laboratories, Inc. (UL)
   5. Insulated Cable Engineers Association (ICEA)
   6. National Electrical Manufacturers Association (NEMA)
   7. Institute of Electrical and Electronics Engineers, Inc. (IEEE)
   8. American National Standards Institute, Inc. (ANSI)
   9. National Fire Protection Association (NFPA)
   10. Local Electric Code
   11. Department of Public Safety (DPS)
   12. Building Officials and Code Administrators International, Inc. (BOCA)
   13. Department of Labor USA. Safety and Health Regulations for Construction (OSHA)
   14. Energy Codes
   15. National Electrical Contractors Association (NECA)
   16. National Bureau of Standards (NBS)
   17. Federal Communications Commission (FCC)
   18. Utilities Serving Project.
   19. Fire Department.
   20. Americans with Disabilities Act Applications Guidelines (ADAAG).
   21. Accessibility Guidelines for Buildings and Facilities.
   22. Any and all Federal, State and Local Standards, Codes and Authorities having Jurisdiction.
   23. In addition, all phases of the Structured Cabling System installation will adhere to applicable Local Area Network (LAN) Specifications of the Institute of Electrical and Electronics Engineers (IEEE), Electronics Industry Association/Telecommunications Industry Association (TIA/EIA), and Building Industry Consulting Service International (BICSI). The entire system and all components will be NRTL certified to appropriate TIA/EIA performance rating Category, Latest TIA/EIA Standards 455-A, 492AAAA, 568-A (latest revision) and (SP-4195-B and SP-4195-B-1), 569-A, 570, 606, 607 and 758, TIA/EIA TSB 67, TSB 72, TSB 75, TSB 95 and other standards as applicable.

C. The Installer will have available at the job site at all times one copy of the latest edition of the Electrical Code, TIA and BICSI Standards applicable to the work as specified within this document.

D. The above requirements will not in any way limit responsibility or requirements to comply with all other codes, standards and laws.

E. Material, equipment, enclosures, and systems will be designed for use as required to suit the conditions, exterior or interior operation, dust tight, water tight, explosion-proof, or other special types.

2.3 UTP PIN/PAIR TERMINATION ASSIGNMENT

A. The UTP cabling systems will have TIA/EIA T568B pin/pair termination assignment. All conductors provided will be properly and consistently terminated at both ends throughout the entire systems. Maintain proper untwist of pairs and removal of jacket per TIA and BICSI.

2.4 SYSTEM PERFORMANCE

A. Horizontal four pair Category 6+ & 6A copper cabling system shall be capable of supporting 1G Base-T and 10G Base-T applications respectively for a total distance of 100 meters with equipment cords.

B. System shall provide “future proof” channel performance and guaranteed margins as noted in this document and is guaranteed to exceed ANSI/TIA/EIA-568-C Category specifications for Insertion Loss, NEXT, PSNEXT, ACR, PSACR, ELFEXT, PSELFEXT, AXT, and Return Losses to ~~250 and~~ 500 MHz for Category 6A. The system is also guaranteed 6Db PSACR headroom 500 MHz for 6A cabling.

2.5 SOURCE QUALITY CONTROL

A. All materials shall be purchased from Distributors authorized by system Manufacturers to sell new and unused components.

2.6 COPPER CATEGORY 6A PATCH PANELS

A. EIA/TIA Category 6A standard.

B. Rack mounted with front-facing RJ-45 patch panels and using rear-facing snap-in termination managers for cable installation.

C. Angled design to facilitate patch cord access.

D. Will be T568-B wired.

E. UL listed.

F. Have a paired punch down sequence to allow pair-twist within ½-inch of the termination. Equipped with Cable Termination Manager modules to ensure minimized untwisting of station cabling during installation.

G. Made of rolled edge black anodized aluminum construction.

H. Must have 48 ports with rear cable suspension racks.

I. Must be from the same manufacturer as the other connectivity products (cable, jacks, faceplates, etc.).

J. Rear patch panel cable management will include the cable support bars/troughs.

2.7 VOICE BACKBONE PATCH PANELS

A. EIA/TIA Category 5 standard.

B. Angled jack mounting to facilitate patch cord access.

C. UL listed.

D. Voice backbone cables shall be extended from the Protector terminal to rack-mounted patch panels. The patch panels shall conform to the following specifications:

E. Rack mounted with front-facing RJ-45 patch panels and rear-facing 110 blocks.

F. Have a paired punch down sequence to allow pair-twist within ½-inch of the termination.

G. Made of rolled edge black anodized aluminum construction.

H. Must have 48 ports with rear cable suspension racks.

I. Must be from the same manufacturer as the other connectivity products (cable, jacks, faceplates, etc.).

2.8 WALLPLATES

A. Manufacturer - Systimax 2 to 4 ports where required.

B. The standard faceplate configuration is single-gang faceplate providing for four ports of connectivity. Configurations of any additional number of ports are subject to the approval of WVMCCD District IS.

C. The faceplate housing the jacks shall provide a symmetrically centered appearance for the modules.

D. Snap-in inserts shall be provided to cover any unused openings in the faceplate. Inserts are removable for future installation of additional jacks.

E. It shall be possible to install the jacks in wall-mounted single and dual-gang electrical boxes, utility poles and modular furniture (cubicle) access points using manufacturer-supplied faceplates and/or adapters.

F. The faceplate housing the jacks shall have a labeling capability using built-in labeling windows, to facilitate outlet identification and ease network management.

G. The faceplate housing the jacks shall accommodate up to a maximum of four modules in a single-gang form.

H. The faceplate housing the jacks shall provide flexibility in present of future network needs such as audio, video, coaxial and optical fiber applications.

I. The color of the faceplate shall be coordinated with the color of the surrounding electrical outlets, usually as Electric Ivory or Electric White.

J. No metal faceplates will be allowed, except as required for extra durability at wall-mount telephone locations and external potentially wet locations.

K. The preferred product is the Systimax MLE faceplate.

A. configuring multimedia workstation outlets that respond to

2.9 CATEGORY 6A JACKS

A. Manufacturer – Systimax, or approved equal.
   1. Communications Faceplate ports shall contain Category jacks which are matched to cable. Jacks shall be terminated to the Horizontal Cabling and inserted into the Communications Faceplate.
   2. Modular jacks shall terminate using 110-style pc board connectors, color-coded for both T568A and T568B wiring. The 110-style insulation displacement connectors shall be capable of terminating 22-24 AWG solid or 24 AWG stranded conductors. The insulation displacement contacts shall be paired with additional space between pairs to improve crosstalk performance. Modular jacks shall utilize a secondary PC board separate from the signal path for crosstalk compensation. Modular jacks shall meet the ANSI/TIA-568-C.2 requirements matching or exceeding the Category performance of the cabling.

B. Modular jack performance shall be third-party verified by a nationally recognized independent testing laboratory.
   1. The jack shall be a punched down on a 110-IDC connector.
   2. The punch down scheme shall be T-568B.
   3. The jack shall be Power Sum rated, with a Power Sum NEXT performance equal to or better than the Category 6A pair-to-pair NEXT performance specifications, and shall have a mark to indicate compliance.
   4. The jack shall have all of its housing components made of fire retardant UL 94V-0 plastic.
   5. The jack shall have a protective cap that snaps in the back of the module to provide strain relief for the conductors after termination.
   6. The jack shall have a minimum Insulation Resistance of 500 mega ohms.
   7. The jack shall be FCC Part 68, Subpart F compliant.
   8. The jack shall be IEC-603-7 compliant.
   9. The jack durability shall be greater than 750 mating cycles (cable insertion/removals).
   10. The jack maximum Current Rating shall be 1.5 amperes.
   11. The jack shall have caps on the front which designate “GS” for voice and “DATA” for data.
   12. All jacks will be installed with the color coded caps.

C. Connection Reliability
   1. Use connectors with 50 µm gold-plated tines (as specified by TIA standards), as well as designs that distance the connection point between the connector tines and plug from the arcing damage.
   2. Connectors should also meet contact resistance requirements found in the IEC 60512-99-001 standard covering connectors for electronic equipment.

2.10 WET LOCATION OUTLETS

A. Ruggedized Connectivity Solution complete with stainless steel faceplate and protective caps
   1. Cap: MIR-CAP
   2. Faceplate:
      a. IR12SP-2 port single gang

a.b. IR24SP-4 port double gang

B. Approved Manufacturer and #: Systimax, MIR-RJ45

2.11 UTP CABLE

1. Manufacturer Systimax
2. Cable jacketing:
   a. Shall be blue and lead-free for ~~IT~~data.
   b. Shall be ~~orange~~ blue and lead-free for WiFi.
   c. Shall be green and lead-free for AV.
   d. Shall be white and lead-free for voice.
   e. Shall be ~~yellow~~ blue and lead-free for security.
3. Cable shall be supplied [in a reel-in-box or on wooden reels]. Cable shall be independently verified for flammability by UL and listed under file number E138034 and shall comply with NEC article 800, NFPA 70, and [CMP (NFPA 262, UL 910) or CMR (ANSI/UL 1666, IEC 332-1)].
4. Copper clad aluminum cables are not permitted. Installation of such will be cause for the necessity of removing the cabling and the installation of copper cables at the contractor's expense.
   a. Any costs associated with project delays caused by the installation of these cables and the removal and installation of acceptable cables will be borne by the contractor.

B. OSP

1. Install outside wet / duct rated cables for horizontal cabling installed in slab-on-grade and exterior applications.
2. Transition to plenum rated cabling where OSP cables must transition to interior spaces when not in conduits to terminus.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to section 27 00 00

B. All installation shall be done in conformance with ANSI/TIA/EIA-568-C standards, BICSI methods, industry standards and manufacturer's installation guidelines. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines shall require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation. This shall also apply to any and all damages sustained to the cables by the Contractor during the implementation.

C. Patch panels will be used for termination of all voice and data station cabling.

D. Cable is to enter perpendicular to the termination and the cable bar facilitates this requirement.

E. All cable bundles on cable support bars will be managed with Velcro straps.

1. Tie-wraps are not acceptable.

F. Cable socks are suitable for routing, but must be transitioned to Velcro bundles at patch panel terminations.

~~F.~~G. Cables are NOT to be painted, and are to be routed through solid bottom cable tray or conduits so that they are not visible.

3.2 STATION PATCH PANELS

A. A maximum of five (5) patch panels will be provisioned per relay rack.

B. Data will be divided into D1 and D2 patch panels (Note: There are no D3, D4 jacks.)

C. Voice station cables will be terminated onto separate patch panels.

D. In all drawings, the contractor shall be instructed to "Verify patch panel layout with WVMCCD before installation".

E. Wired with one pair punched down per jack, 25th pair coiled as a test point.

F. Provide shall provide a 3-foot service loop above the access ceiling or cable trays unless specified otherwise. All service loops shall be a minimum of 18 inches in diameter and be accessible for maintenance.

G. Coordinate loop placement and orientation with the technology consultant. This allows for future changes or expansion without installing new cables.

H. Cabling between communications rooms and workstation locations shall be made as individual "home runs". No intermediate punch down blocks or splices may be installed or utilized between the communications rooms and the information outlets at the workstation location.

I. All cable must be handled with care during installation so as not to change performance specifications. Factory twists of each individual pair must be maintained up to the connection points at both ends of the cable. There shall never be more than .5 inches of unsheathed Category 5e or 6 UTP cable at either the wiring closet or the workstation termination locations.

J. All cabling and associated hardware shall be placed so as to make efficient use of available space. All cabling and associated hardware shall be placed so as not to impair equipment's efficient use of their full capacity.

K. EMT or Conduit for pathways shall have no more than two 90 degree bends and no continuous section over 100'. Each conduit opening will be fitted with a nylon bushing to prevent damage to cables.

L. Provide cable J-Hooks to support main pathway cable bundles.

M. Exposed Cable
   1. All station cabling shall be installed inside walls or ceiling spaces whenever possible.
   2. Exposed station cable will only be run where indicated on the drawings and will only be allowed when no other options exist. Owner must approve all exceptions.

N. Wireless Access Point Cable Requirements
   1. Install horizontal cable from dedicated wireless patch panel(s) in telecommunications room terminated with a modular jack on the WAP location (wired to project standard).
   2. All WAP locations and cables shall be accessible by use of a 6' ladder.

O. Coordinate with other trades on whether there is a presence of variable frequency drive motors (VFD) being used above ceilings or at any location in the building, and if so, where their locations are.
   1. Route cabling away from VFD motors, maintaining a minimum of 6 feet from the motors.

P. Special Circuits
   1. The Contractor shall coordinate with the Owner on the cable termination plan for special circuits (cables to wireless access point locations, IP security cameras, emergency analog telephone lines (elevators, fire alarms, etc.), service provider special circuits, security circuits, etc.).
      a. IP security cameras shall be terminated with an 8P8C modular jack at the device end.
      b. WAP jack placed in standard box and plate above ceiling.
      c. Security Camera jacks shall be the surface mount 'biscuit' type. Place biscuit jack in 5 square box at locations indicated on drawings.
      d. Location and termination field description
         1) Room location
         2) Rack-mount or wall mount
         3) Termination field type

Q. Specific patch panel ports versus a separate dedicated patch panel

R. 110-type blocks
      a. Unique identifiers
         1) Segregation and position on equipment rack
         2) Port color-coding
         3) Unique labeling
   2. The Contractor shall provide a copy of the finalized plan in writing to the Owner's representative for review and authorization to proceed.

S. All cabling placed above drop ceilings must be supported by cable tray, conduit, or J-Hooks. The Contractor shall permanently affix cable supports to the building structure or substrates and provide attachment hardware and anchors designed for the structure to which attached and are suitably sized to sustain the weight of the cables to be supported. Attaching cable to pipes or other mechanical items is not permitted. Communication cables shall be routed so as to provide a minimum of 18 inches spacing whenever possible from light fixtures, sources of heat and EMI sources. Cabling shall not be attached to ceiling grid wires. Multiple cables are to be dressed every 5 feet to 7 feet. Maximum cable sag between cable hooks is 3"-6". Plastic/nylon tie-wraps are not allowed to permanently secure cables inside the Telecommunications Rooms. (See Section 270529 Hangers and Supports for Communications Systems).

T. Maximum allowable temperature rise above ambient temperature is 55 degrees F.
   1. Reduce cable bundle sizes and separate bundles to mitigate cable bundle temperature rise to a max of 55 delta from ambient.
   2. Maximum allowable cable bundle internal temperature is 130 degrees F. Provide mitigation if allowable temperatures are exceeded.

U. In the Telecommunications Room (TR), cables shall be combed and dressed with Velcro ties in a manner as to prevent twists, "braiding" and crossed cables in the cable bundle from the telecommunication room entrance to the termination point at the rear of the patch panel. Behind the patch panel, the cable bundle shall be attached to the rear cable support bar, and shall drop out each cable in a neat, cascading manner to prevent crossed and/or interwoven cables to each patch panel port termination point.

V. Identification:
1. Label cable terminations on designation strips.
2. Label all cable at each terminating point.
3. Label each port of the work area outlet.
4. Cable identification numbers shall not be duplicated.
5. Labeling convention to be coordinated with Owner.
6. Label data patch panels and voice blocks in the communications rooms to match those on the corresponding voice and data outlets. The font shall be at least .125-inch in height.
7. Where a wireless access point is installed above an acoustical ceiling, label the ceiling grid frame below the access point, displaying the data port number and, if applicable, the access point identification number. Coordinate with the Owner for all access point identification information.
8. All labels shall correspond to as-built drawings and to final test reports.
9. Coordinate with Owner for specifications on labeling of all hardware, cabling, and related equipment prior to any testing.
10. Label each distribution rack, block and other terminating equipment unit and field within that unit within 4 inches from the block or patch panel termination. Keep labels in a neat and orderly lineup.
11. Label each connector and each discrete unit of cable-terminating and connecting hardware within connector fields, in wiring closets and equipment rooms. Where similar jacks and plugs are used for both communication and data-processing equipment, use a different color for jacks and plugs of each service.
12. Post the cable schedule in a prominent location in each wiring closet and equipment room. List incoming and outgoing cables and their designations, origins, and destinations.
13. Provide electronic copy of final comprehensive schedules for project in software and format selected by Owner.
14. Refer to the following drawing for faceplate labeling:
15. All cable labels shall:
    a. Be marked at each end, on the sheath indicating the Telecommunications Room and jack number to which the cable is wired.
    b. Backbone cables shall be marked at each endpoint and at all intermediate pull/ access points or junction boxes. Label shall indicate origination and destination Telecommunication Rooms, sheath ID and strand or pair range.
    c. Meet the legibility, defacement, exposure and adhesion requirements of UL 969.
    d. Be pre-printed or laser printed type.
    e. Where used for cable marking, a label with a vinyl substrate and white printing area and a clear “tail” that self laminates the printed area when wrapped around the cable shall be provided. The label color shall be different than that of the cable to which it is attached.
    f. Where insert type labels are used, provide clear plastic covers to go over label.
    g. The Contractor shall confirm specific labeling requirements with the Owner or Owner’s Representative prior to cable installation or termination.

W. Documentation:
1. All cable inventory data documentation shall be submitted in format coordinated with and approved by Owner so that data can be incorporated into existing databases.
2. Documentation shall include cable identification number, source and destination, type of cable, length of cable and number of pairs or fibers.
3. Complete cross connect documentation is required. It shall include detailed documentation of each pair of all copper backbone cable and strand of fiber.

3.3 CABLE REQUIREMENTS BY OUTLET TYPE

A. Cable quantities are indicated by outlet type designations such as A, B, C, etc.

1. Projector Type B (2D)
2. Wireless access point Type B (2D)
3. IP camera Type B (2D)
4. Type A: Voice/Data outlet is defined as two (2) voice and two (2) data cables, terminated in a four-port faceplate, usually at a height of +36"A.F.F.
   a. Typical installation: offices.
5. Type B: (wall) Data outlet is defined as two (2) data cables, terminated in a four-port faceplate with two blanks, usually at a height of +18" A.F.F.
   a. Typical Installation: classroom.
6. Type B: (ceiling/confined space) Data outlet is defined as two (2) data cables, terminated in a two- port, plenum SMB above the ceiling space or confined space.
   a. Typical Installation: access point, IP camera.
7. Type C: (wall) Data outlet is defined as four (4) data cables, terminated in a four-port faceplate. Height varies with installation.
   a. Typical installation: computer lab.
8. Type C: (ceiling/confined space) Data outlet is defined as two (2) data cables, terminated in two (2) two-port, plenum SMB above the ceiling space or confined space.
   a. Typical Installation: LCD display, projector, security gutter.
9. Type D: Voice outlet is defined as one (1) voice cable, terminated in a one-port metal faceplate, for wall-mount telephones at a height of +42" A.F.F.
   a. Typical installation: classroom, corridor. Telephone clearance required as 12" on all sides from center jack.

3.4 FIBER LOSS BUDGET

A. Total maximum loss budget for a 40 or 100 GbE link is 1.9 dB.
   1. Re-do connections to achieve this budget.

3.5 CLEANING

A. All surfaces, cabling, and hardware shall be kept clean and free of dust and debris.

B. Clean as needed and protect as required to maintain this requirement.

3.6 ACCEPTANCE

A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.

B. Contractor's RCDD shall warrant in writing that 100% of the installation meets the requirements specified herein.

3.7 FIELD QUALITY CONTROL

REFER TO SECTION 27 00 00

END OF SECTION

SECTION 27 1600 - COMMUNICATIONS CONNECTING CORDS, DEVICES AND ADAPTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for connecting cords, devices and adaptors, supplementing requirements found in the related sections.

B. Related Sections
1. 270000: Communications
2. 270526: Grounding and Bonding of Communication Systems
3. 270536: Communication Cable Pathways
4. 270810: Optical Fiber Testing and Measurement
5. 270820: Copper Testing
6. 271100: Communications Equipment Room Fittings
7. 271300: Communications Backbone Cabling
8. 271500: Communications Horizontal Cabling

1.2 WORK INCLUDED

A. The Work of this Section shall consist of the labor, materials and equipment required for furnishing and installing telecommunications patch cables and equipment cords as part of a complete and functional telecommunications system.

B. All items specified or included in this section shall be furnished and installed by Telecommunications Contractor, wired and connected by Telecommunications Contractor and tested by Telecommunications Contractor, unless noted otherwise. “Contractor” as used herein shall mean Telecommunications Contractor or Telecommunications Contractor’s sub-contractor.

C. Communications Patch Cords, Station Cords, and Cross-Connect Wire
1. Data cable assemblies for the horizontal cross-connect and the workstation shall match horizontal, patch panel, and jack Category.
2. Data cable assemblies shall be factory-assembled by the manufacturer of the cabling system.
3. Provide data backbone factory-terminated fiber optic cable assemblies (Duplex LC to LC duplex) using duplex XG 850nm laser-optimized 50/125µm and Single-mode cable cross-connect assemblies in equipment rooms.
4. Provide patch cord quantities on shop drawings.

1.3 COORDINATION

A. Contractor shall furnish and install the following:
1. Patch and Equipment cords, for both copper and fiber.

B. Electrical Contractor shall furnish and install the following:
1. Floor boxes, box covers, straps.
2. Boxes above ceilings and box covers.

C. Unless noted, the following items will be the responsibility of the Owner:
1. All electronics and active data networking equipment, etc.
2. Telephones, fax machines and modems, etc.
3. PC’s, printers, video display terminals, flat panel displays, etc.

D. Contact the Owner's network and computer equipment personnel for specific instructions before starting Work.

PART 2 - PRODUCTS

2.1 COPPER PATCH & EQUIPMENT CORDS

A. Patch cables and equipment cords shall be factory pre-connectorized, TIA/EIA compliant matching horizontal cable specifications, 4 pair UTP, 8-position modular jack, and stranded conductors. Patch cables and equipment cords shall be able to withstand at least a minimum of 200 jack mating cycles without any transmission degradation.

B. Provide all cords the same Category rating as cable, jacks and patch panels installed.

C. Provide patch cable lengths as coordinated with Owner. For bidding purposes assume 50% for 2M, and 25% for 1M, & 3M lengths.

D. Patch Cables For Equipment Rooms:
1. Provide one UTP patch cable for each horizontal cable terminated on patch panels.
2. Coordinate patch cable lengths and color with the Owner prior to ordering.
3. Provide fifteen (15%) spare patch cables for each cable provided.

2.2 PROVIDE EQUIPMENT CORDS AS FOLLOWS:

A. Every jack shall be provisioned with a Category 6A patch cord.
1. Coordinate lengths and quantity with WVMCCD during the design phase.
2. Coordinate equipment cord lengths and color with the Owner prior to ordering. Minimum length: 10'.
3. Provide fifteen (15%) spare equipment cords for each cable provided.
4. Cords are to be new and factory terminated, delivered in original unopened packages.

B. Connection Reliability
1. Use connectors with 50 µm gold-plated tines (as specified by TIA standards), as well as designs that distance the connection point between the connector tines and plug from the arcing damage.
2. Connectors should also meet contact resistance requirements found in the IEC 60512-99-001 standard covering connectors for electronic equipment.

C. Provide wet location station cords (with boots) for each exterior data outlet, plus 4.
1. Ruggedized plug to standard RJ45. Confirm patch cord lengths and ends with Owner prior to purchase.

D. Manufacturer – Match approved manufacturer's solution

2.3 FIBER OPTIC PATCH CORDS

A. Patch cables and equipment cords shall be factory pre-connectorized, TIA/EIA compliant.

B. Manufacturer: CommScope, or approved equal.
1. Provide one duplex fiber patch cable per two terminated fibers.
2. Connectors:
3. Lengths: 2 meters. Verify with Owner prior to purchase

C. Confirm connector types with Owner prior to purchase.
1. Provide the following Multi-mode Core Style/Polish Type:

a. [50/125 laser optimized cords to match installed backbone and riser fiber]

2. ~~Provide~~ Confirm the following Single-mode Core Style/Polish Type:
   a. [UPC Polish]
   b. [APC Polish]
3. Provide the following Cable Type:
   a. Duplex Plenum
4. ~~Provide~~ Confirm if the following Hybrid Connector Combinations are required:
   a. [SC to SC]
5. Provide the following Standard and Pigtail Connector Combinations:
   a. [LC to LC]
6. Provide the following Mode Type:
   a. Single-mode
   b. Multi-mode
7. ~~Provide~~ Confirm the following Cable Lengths Quantity mix TBD:
   a. [(1m) = 3.3']
   b. [(2m) = 6.6']
   c. [(3m) = 9.8']

PART 3 - EXECUTION

3.1 ADDITIONAL INFORMATION

A. Refer to Section 27 00 00 for submittal and other general requirements

3.2 INSTALLATION

A. Patch cords shall be delivered to the Owner in factory sealed packages.
   1. Coordinate on delivery timing with GC and Owner to ensure any circuits required for permit or occupancy certificates will be active and connected on time.

B. Install all patch cords in accordance with the Owners I.T. Department or the person in charge of the telecommunications infrastructure.
   1. After discussion with Owner, provide matrix of patching from port to switch port.

C. Bend radius of cables shall be maintained as recommended by the manufacturer and per BICSI standards.

END OF SECTION