

SECTION 01 11 10
SUMMARY OF WORK - GENERAL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. There is a Division named "General Requirements" (Division 1) and a Section named "General Requirements" (Section 01 00 00) within Division 1. Section 01 00 00, General Requirements, authored by the Owner, has a "Division Level" Section title (according to CSI MasterFormat), and includes certain General Requirements for the work. Other Division 01 Sections supplement the provisions of Section 01 00 00, General Requirements.
1. Sections of Division 1, General Requirements, govern the execution of all sections of the Specifications.

1.2 DESCRIPTION

- A. See Section 01 11 10. (followed by the Document Package Designation).
1. Examples:
 - a. EWP-1 will be Section 01 11 10.EWP-1.
 - b. EWP-2 will be Section 01 11 10.EWP-2
 - c. WP-8 will be Section 01 11 10.WP-8.

1.3 PHASED PROJECT

- A. There are multiple document packages involved in the construction of the SLVHCS REPLACEMENT MEDICAL CENTER PROJECT, located in New Orleans, Louisiana.
- B. The Document Packages, are as follows; and may be revised without notice:

Document Package Designation	Title
EWP-1	SURCHARGE
EWP-2	ELEVATORS
EWP-3	PAN AMERICAN BUILDING RENOVATION
EWP-4	PARKING GARAGES / PILES ALL BUILDINGS
EWP-5	PILE CAPS / STRUCTURAL STEEL / CEP STRUCTURE
EWP-6	SKIN (ALL BUILDINGS)
EWP-7	CENTRAL ENERGY PLANT (MEP ONLY)
WP-8	CAMPUS
WP-9	RESEARCH BUILDING
WP-9A	STABILIZATION OF DIXIE BLDG. AND MAJOR DEMOLITION
WP-9B	ADDITION AND RENOVATION

1.4 CONTRACTS

- A. Construction Manager for this Project is Project's constructor. In Divisions 01 through 49 Sections, the terms "Construction Manager", "Contractor", and "General Contractor" are synonymous. "Trade contractor" refers to Construction Manager's Sub- and Sub-Subcontractors.
- B. Where the Construction Documents refer to the Resident Engineer, the Owner reserves the right, upon the Architect's consent, to redirect the related Construction Manager's requirements to the Architect and conversely.

1.5 SECTIONS OF THE WORK

- A. The Specifications for the work are arranged in various Sections relating to products, systems, or both as a convenience to the Construction Manager to more clearly show the extent of work involved. These Sections are not intended to define any complete Subcontract. Construction Manager shall verify proposals and shall furnish all labor, materials, appliances and services necessary to provide a complete installation as indicated in the Contract Documents. The Architect's position is that all work is performed by the Construction Manager and questions concerning work included under Trade Contractors is entirely between the Construction Manager and his Trade Contractors.
- B. Project Manual Document and Section Number Format: Six digit Section numbers formatted without spaces (such as "000000") and with one space (such as "00 0000") are as though they were formatted with two spaces (such as "00 00 00") and conversely.
 - 1. Document/Section Name/Number Correlation: See DOCUMENT PACKAGES below.

1.6 DOCUMENT PACKAGES

- A. Disclaimer: Document "packages" prepared by the Architect do not necessarily define full "scope" of work by trades or contracts. Such scope of work shall be defined by the Construction Manager.
- B. Content of packages are based on normal sequence requirements of design and construction plus long lead items identified by Construction Manager.
- C. Packages are intended to cover general areas of construction and may contain more or less information required for specific subcontracts. Further, as subsequent packages are released, information from previous packages may remain in a duplicated form. Again, the determination for scope of work for any one package is solely the responsibility of the Construction Manager. The full scope of the Project will be contained in the various packages upon completion of all documents as determined by the Architect.
- D. Document/Section Name/Number Correlation: Among the Document Packages, the requirements within identically named/numbered Project Manual Documents/Sections may or may not be identical.

1.7 OWNER-FURNISHED PRODUCTS

- A. Miscellaneous furnishings and equipment, except as shown and specified, will be furnished and installed by the Owner. Do not construe this paragraph as releasing Construction Manager's

obligation to provide complete systems for all work shown or specified, and necessary for all furnishings and equipment to function and operate properly.

- B. See Section 01 00 00, General Requirements, Article "See Section 01 00 00, General Requirements, Article "GOVERNMENT-FURNISHED PROPERTY".

1.8 BUILDING CODE; CONSTRUCTION AND OCCUPANCY CLASSIFICATIONS

- A. As indicated on drawings.

1.9 GENERAL SEQUENCING

- A. Establish proper construction sequence to protect sensitive interior finishes from weather and water exposures of all types. This is to not only protect against the obvious direct damage from water, but also to protect against formation of mold and mildew.
1. Special attention is directed to materials and surfaces concealed from view in completed work.
 2. Building shall achieve "permanent enclosure" as defined below or areas where work must be installed prior to permanent enclosure shall be properly protected from weather and damage, before installation of gypsum wallboard and other paper-faced products.
 3. Permanent enclosure is defined as permanent walls, roofs, copings, and flashings in place and weathertight, windows in place and glazed and all entrance enclosures either permanently in place or provided with suitable temporary enclosures.
 - a. Equipment: Permanent HVAC system, or temporary HVAC.
 - b. Work Restrictions: None except as may be stated in separate specification Sections or required by manufacturer, such as special ventilation requirements.
- B. Exterior Walls: Protect walls which may accumulate water from water intrusion due to work stoppage for reasons listed below, including, but not limited to, and in a manner appropriate to length of stoppage: Maintain such protection throughout stoppage periods.
1. Normal daily procedures.
 2. Strikes.
 3. Construction Manager defaults.

1.10 STRUCTURAL DESIGN DATA

- A. Refer to Structural Drawings for the following information:
1. Wind Design Parameters:
 - a. Cladding.
 2. Seismic Design Parameters

1.11 HVAC DESIGN DATA

- A. Winter:
1. Exterior: 30.6° F DB.

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2. Interior:
 - a. Typical: 75°F DB @ 30% RH minimum.
 - b. D&T: 75°F DB @ 30% RH minimum.
 - c. OR's and ICU's: 75°F DB @ 30-60% RH capability.
 - d. Central Energy Plant (CEP): 70°F DB, no humidity control.
 - e. Mechanical/Electrical Equipment Spaces: 60°F DB, no humidity control.
 - B. Summer:
 1. Exterior: 93.8° F DB. 78.8° F WB.
 2. Typical Interior: 75°F DB @ 50% (max) RH.
 3. Mechanical/Electrical Equipment Spaces: 86°F DB @ 60% maximum RH.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 ERECTION

- A. See Section 01 73 00 - Execution.

3.2 SAFETY

- A. See Section 01 73 00 - Execution.

3.3 ELEVATOR WORK

- A. See Section 01 73 00 - Execution.

3.4 WEATHERTIGHT CONSTRUCTION

- A. The Contract Documents have been prepared with the intention that the Project is weathertight for enclosed spaces. The Contract Documents have been prepared so that the building enclosure including roofs, exterior wall systems, and fenestration shall not leak water to building interior under design conditions nor shall there be uncontrolled water within the building enclosure construction. Where the construction documents do not provide guidance; advise Architect and request clarification of detail(s) in question. Waterproofing as indicated.

3.5 EXISTING CONDITIONS

- A. As indicated in Section 00 31 00 - INFORMATION TO BIDDERS, there are existing utilities and existing piles and the building site that are to remain unless indicated otherwise.
1. Abandoned Utilities: Abandoned utilities conflicting with work shall be removed or broken to alleviate conflict with work at no additional cost to Owner or Department of Veterans Affairs. Work shall conform to the requirements of Section 31 20 00 - Earth Moving.
 2. Existing Piles: There are approximately 221 existing piles within the project site.
 - a. Existing Piles within Building Footprints: There are three clusters of piles that EWP-1 removes. There are 31 piles within the three clusters. All other existing piles within the building footprints remain unless ALTERNATE 1B is accepted. See ALTERNATE 1B in Section 01 23 00 - ALTERNATES issued with EWP-1.
 - b. Existing Piles Outside of Building Footprints: Piles are to remain except as specified in Section 02 41 00 – Demolition.
 - c. Existing Piles that conflict with work shall be cut and cut portion of pile removed from site to alleviate conflict with work. Cutting of piles and associated earthwork shall be done in conformance with Section 31 20 00 - Earth Moving.
 - d. Construction Manager shall advise trade contractors on status of ALTERNATE 1B and ALTERNATE 1C, which where issued with EWP-1; which impact existing piles within the building footprints.
 3. Specification Sections 31 20 00 - Earth Moving, Section 02 41 00 – Demolition, and Section 01 23 00 – ALTERNATES referenced above are part of a previous work package, and are available through the Construction Manager.

- - - END OF SECTION - - -

SECTION 01 11 10.WP-9B
SUMMARY OF WORK FOR WP-9B

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. See Section 01 11 10, Summary of Work - General.

1.2 DESCRIPTION

- A. The specifications and drawings included in this work package are called WP-9B. Briefly and without limiting scope indicated elsewhere, WP-9B includes the following:
1. Weather tight exterior enclosure systems system, including roofs.
 2. Site work, including landscaping, except site work under Work Packages (EWP-1 through WP-8)
- B. Buildings 01 through 07, 09, and 10 are excluded and WP-9A is excluded. See Section 01 11 10, Summary of Work - General, for WP-9.
- C. See Section 01 00 00, General Requirements, Article "STATEMENT OF BID ITEM(S)".
- D. See Section 01 00 00, General Requirements, Article "STATEMENT OF BID ITEM(S)".

1.3 SUMMARY OF MEDICAL EQUIPMENT

- A. This Summary lists responsibility for purchase (furnish) and installation of the various pieces of medical equipment. Responsibilities are categorized under the following "Codes" listed under "Costing" column:

CODE	FURNISHED BY	INSTALLED BY	DESCRIPTION
CC	Contractor	Contractor	Contractor-Furnished/Contractor-Installed
CF	Owner	Contractor	Owner-Furnished. Owner's Choice for Installation: Owner or Contractor.
VC	Owner	Contractor	Owner-Furnished/Contractor-Installed
VV	Owner	Owner	Owner-Furnished/Owner-Installed
VVV	Owner	Vendor	Owner-Furnished/Vendor-Installed
N.I.C.	Not in Contract	Not in Contract	Not in Contract
Shared Resource			No Contractor involvement

- B. Medical equipment listed is by catalog number and brief description of item. Full description of medical equipment, including required mechanical/electrical services, is contained in the "Medical Equipment Activation Report".
1. The "Medical Equipment Activation Report" along with associated cut sheets is contained in separate volumes 2-1 through 2-2 of "Supplemental Information" available from the Construction Manager.
 2. The "Medical Equipment Activation Report" represents the best information available. This document is subject to change.
 - a. Some equipment may be bid under separate documents.
 - b. Revisions to document will be made electronically; see Construction Manager.

3. Refer to referenced document for required mechanical/electrical services. Verify requirements of Contract Documents agree with service requirements indicated in the "Medical Equipment Activation Report". Advise Architect, through Construction Manager of discrepancies.

C. Related Sections:

1. Section 01 11 10 - Summary of Work - General
2. Section 01 23 00: Alternates
3. Division 21: Fire Suppression.
4. Division 22: Plumbing.
5. Division 23: HVAC.
6. Division 25: Integrated Automation
7. Division 26: Electrical.
8. Division 27: Communications
9. Division 28: Electronic Safety & Security

1.4 PHASED PROJECT

- A. See Section 01 11 10 - Summary of Work - General.

1.5 CONTRACTS

- A. See Section 01 11 10 - Summary of Work - General.

1.6 SECTIONS OF THE WORK

- A. See Section 01 11 10 - Summary of Work - General.

1.7 DOCUMENT PACKAGES

- A. See Section 01 11 10 - Summary of Work - General.

1.8 OWNER-FURNISHED PRODUCTS

- A. See Section 01 11 10 - Summary of Work - General.

1.9 BUILDING CODE; CONSTRUCTION AND OCCUPANCY CLASSIFICATIONS

- A. See Section 01 11 10 - Summary of Work - General.

1.10 GENERAL SEQUENCING

- A. See Section 01 11 10 - Summary of Work - General.

1.11 STRUCTURAL DESIGN DATA

- A. See Section 01 11 10 - Summary of Work - General.

1.12 HVAC DESIGN DATA

- A. See Section 01 11 10 - Summary of Work - General.

1.13 SPECIFICATION AND DRAWING CONVENTIONS

- A. See Section 01 11 10 - Summary of Work - General.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 ERECTION

- A. See Section 01 73 00 - EXECUTION.

3.2 SAFETY

- A. See Section 01 73 00 - Execution.

3.3 ELEVATOR WORK

- A. See Section 01 73 00 - Execution.

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 - GENERAL

1.1 GENERAL

- A. This Section describes the changes to be made under each Alternate.
- B. Coordinate pertinent related work and modify surrounding work required to complete the project.
- C. Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

1.2 ALTERNATES 1.00 – 8.00 Series

- A. Not used in WP-9B.

1.3 ALTERNATE 9.01 – RUNNING BOND FACE BRICK

- A. Areas Affected: New brick veneer with colored mortar.
- B. Description: Provide stretcher stack bond with horizontal reinforcing in brick masonry.
- C. Base Bid: Running bond without horizontal reinforcing in brick masonry.

1.4 ALTERNATE 9.02 – SPANDREL GLASS

- A. Areas Affected: All windows in new brick walls with spandrel glass.
- B. Description: Replace spandrel glass and associated framing with accent-colored brick including CMU backup with bond beams; as specified under Section 04 20 00, Unit masonry. Provide steel lintels as specified under Section 05 50 00, Metal Fabrications.
 - 1. ALTERNATE 9.02-A – STACK BOND BRICK.
 - 2. ALTERNATE 9.02-B – RUNNING BOND BRICK.
- C. Base Bid: Spandrel glass in metal framing as specified under Section 08 44 13, Glazed Aluminum Curtain Walls.

1.5 ALTERNATE 9.03 – FLOOR DRAINS AND DEPRESSIONS IN ANIMAL HOLDING ROOMS

- A. Areas Affected: All Animal Holding Rooms except Rabbit Holding.
- B. Description: Delete floor depressions associated with floor drains. See Alternate 9.34 below for plumbing work.
- C. Base Bid: Retain floor depressions associated with floor drains.

1.6 ALTERNATE 9.04 – TERRAZZO TILE

- A. Areas Affected: All rooms scheduled to receive porcelain tile flooring with Finish Codes of CTF-1, CTF-2, CTF-2A, ~~CTF-3 and CTF-3A.~~
- B. Description: Provide terrazzo tile flooring and base with TT and TERB Finish Codes listed below and specified under Section 09 66 16, Terrazzo Floor Tile.
 - 1. Flooring:
 - a. A TT-1 replaces porcelain tile type CTF-1.
 - b. A TT-2 replaces porcelain tile types CTF-2 and CTF-2A.
 - c. A TT-3 replaces porcelain tile types CTF-3 and CTF-3A.
 - 2. Base: 4-inch high porcelain tile to match flooring.
- C. Base Bid: Porcelain tile flooring and base as specified under Section 09 30 13. Ceramic/Porcelain Tiling.

1.7 ALTERNATE 9.05 – ULTIMA CEILING TILE

- A. Areas Affected: Acoustic ceilings with #AT-4, "Dune" tile.
- B. Description: Provide acoustic ceiling tile #AT-5, "Ultima" except grid is 15/16" steel as listed for AT-4 in Finish Legend.
- C. Base Bid: Acoustic ceilings with #AT-4, "Dune" tile with grid as listed on Finish Legend.

1.8 ALTERNATE 9.06 – GRAB BARS

- A. Areas Affected: Public toilet room stalls
- B. Description: Provide two 30-inch long grab bars per stall as specified under Section 10 28 00, Toilet, Bath and Laundry Accessories.
- C. Base Bid: No grab bars in these stalls.

1.9 ALTERNATE 9.07 – Not used.

1.10 ALTERNATE 9.08 – ANIMAL HOLDING WALL CONSTRUCTION

- A. Areas Affected: Walls in all animal holding rooms.
- B. Description: Provide impact-resistant gypsum board on metal studs with resinous wall coating finish. Basis of Design for resinous wall coating is Stonglaze VSE by Stonhard.
- C. Base Bid: CMU with block filler and epoxy finish.

1.11 ALTERNATE 9.9 – WALL PROTECTION

- A. Areas Affected: Level 04 designated walls.
- B. Description: Deduct Alternate. Provide Type **WP-02** wall protection as indicated on Drawing 8AF007 and specified under Section 10 26 00, Wall and Door Protection.

- C. Base Bid: Type WP-05 wall protection as indicated on Drawing 8AF007 and specified under Section 10 26 00, Wall and Door Protection.

1.12 ALTERNATE 9.10 – RESINOUS FLOORING

- A. Areas Affected: Rooms listed at end of this Section:
- B. Description: Provide resinous flooring as specified under Section 09 67 25. Resinous Floor and Wall Covering.
- C. Base Bid: Resilient sheet flooring with welded seams as specified under Section 09 65 16, Resilient Sheet Flooring.

1.13 ALTERNATE 9.11 – CAFÉ FIT-OUT

- A. Areas Affected: Room #296, Future Café. Coordinate with Alternate 9.37.
- B. Description: Provide the following:
1. New partitions as specified under Sections 09 22 16, Non-Structural Metal Framing, 09 27 02, Gypsum Board, and 09 91 00, Painting.
 2. Casework as specified under Section 06 40 00.
 3. Food Service Equipment as noted in SN food service design and specified under Section 11 40 00.
- C. Base Bid: Includes the following:
1. New concrete floor slab.
 2. Stub-ups for utilities (based on studio NOVA's food service consultant design).
 3. HVAC distribution.
 4. Additional grease trap as required per SN food service consultant design.
 5. Painted gypsum board, furring and insulation for exterior walls.
 6. Basic lighting, floor treatment, and ceiling system.
 7. Emergency exit door on Tulane Avenue; door to carriageway.
 8. Temporary partitions for vestibule to access carriageway separate from shell space.
 9. Required structural/ blast upgrades.

1.14 ALTERNATE 9.12 – INTERIOR GLAZING AT LABS

- A. Areas Affected: Lab rooms on 2nd and 3rd Floors.
- B. Description: Provide total of 14 Type SG-1 fixed glass vision windows in hollow metal frames. Size 4' x 4'. See interior elevation C6 on Drawing 8AI201.
- C. Base Bid: No windows.

1.15 ALTERNATE 9.13 – DUCTED EXHAUST FOR ANIMAL HANDLING BIOLOGICAL SAFETY CABINET

- A. Areas Affected: Soil Cage Wash Rm. 4P304.
- B. Description: Provide ducted exhaust Animal Bedding Dumping Station #STA2007 in lieu of non-ducted unit #V0120 shown as base bid.

1. Modify mechanical system to included ductwork and airflow controls for connection to an Owner-Furnished, Contractor-Installed Nuaire Labgard NU-602-600, Class II, Type A2 – Animal Handling Biological Safety Cabinet. Replace with NU-928 TET canopy exhaust transition having a (10”) diameter.
 - a. Identified in Equipment Activation List as #STA2007.
2. See Section 11 53 53, Biological Safety Cabinets for bio-safety cabinet unit requirements for accommodation of this alternate.
3. ALTERNATE 9.13A: Provide NU-928 TET canopy exhaust transition (10”) diameter.
4. ALTERNATE 9.38: Provide ductwork exhaust to exterior and airflow controls. See MECH/ELEC/PLUMBING ALTERNATES below.

C. Base Bid: Unducted Animal Bedding Dumping Station #V0120.

1.16 MECH/ELEC/PLUMBING ALTERNATES

A. ALTERNATE 9.30: PROVIDE ALUMINUM IN LIEU OF COPPER FOR SELECTED FEEDERS

1. See Division 26 for complete description of this Alternate.

B. ALTERNATE 9.31: PROVIDE L TYPE PIPING FOR MED GASES IN LIEU OF TYPE K

1. See Division 22 for complete description of this Alternate.

C. ALTERNATE 9.32: PROVIDE STANDARD WEIGHT STEEL PIPE IN LIEU OF SCHEDULE 40 STEEL PIPE FOR HYDRONIC PIPING OF 12” PIPE SIZE AND LARGER.

1. See Division 23 for complete description of this Alternate.

~~D. ALTERNATE 9.33: PROVIDE PVC PIPING FOR SANITARY VENT SYSTEMS IN LIEU OF CAST IRON PIPING.~~

- ~~1. See Division 22 for complete description of this Alternate.~~

E. ALTERNATE 9.34: DELETE FLOOR DRAINS

1. **Delete floor drains in the depressions and associated waste and vent piping as applicable.** See Alternate 9.03 above.
2. **Base Bid: retain floor drains in the depressions and associated waste and vent piping as indicated in documents.**

F. ALTERNATE 9.35: TREATMENT ROOM HVAC UPGRADES

1. See Division 23 for complete description of this Alternate.

G. ALTERNATE 9.36: CLEAN STEAM GENERATOR

1. See Division 23 for complete description of this Alternate.

H. ALTERNATE 9.37: CAFÉ FIT-OUT

1. See Alternate 9.11 and Divisions 21-28 for complete description of this Alternate.

I. ALTERNATE 9.38: DUCTED EXHAUST FOR SAFETY CABINETS

1. See Alternate 9.13 for description of this Alternate provided under Division 23.

J. ALTERNATE 9.39: Add Alternate Emergency Electrical feeders

1. DELETE - RWH Emergency Electric Feeders of 600v and below and conduit system where specified to have a 2 hour fire rating.
2. ADD - MI Cable System 1850 manufactured by Tyco for Emergency Electric Feeders of 600v and below where specified to have a 2 hour fire rating.

3. Refer to specification "ALTERNATE Spec Section 26 05 21 Low-Voltage Electrical Power Conductors and Cables (600 Volts and Below)", included as an attachment to this spec section. Additionally, refer to sketches SK-9-BA-ES-001 & SK-9-BA-ES-002 which show changes that will be made to base bid documents if this alternate is accepted.
4. Base Bid: RWH Emergency Electric Feeders and conduit system as shown/specified in documents issued on 7/16/12 (not documentation issued in Addendum #2).

1.17 ALTERNATE 9.10 ROOM LIST

Rad Wst	1P115E
Lab 1	2P138
Lab 2	2P142
Lab 3	2P148
Lab 4 & 5	2P152
Lab 6	2P162
Lab 7 & 8	2P168
Lab 9	3P138
Lab 10	3P142
Lab 11	3P148
Lab 12 & 13	3P152
Lab 14	3P162
Lab 15	3P168
Lab 1 Hoods	2P138B
Lab 2 Hoods	2P142B
Lab 3 Hoods	2P148B
Lab 4 & 5 Hoods	2P152B
	2P152C
	2P152D
	2P152E

Lab 7 & 8 Hoods	2P168B
	2P168C
Lab 6 Hoods	2P162B
Lab 9 Hoods	3P138B
Lab 10 Hoods	3P142B
Lab 11 Hoods	3P148B
Lab 12 & 13 Hoods	3P152B
	3P152C
	3P152D
	3P152E
Lab 14 Hoods	3P162B
Lab 15 Hoods	3P168B
	3P168C
Lab 1 Entry	2P138A
Lab 2 Entry	2P142A
Lab 3 Entry	2P148A
Lab 4 & 5 Entry	2P152A
Lab 6 Entry	2P162A
Lab 7 & 8 Entry	2P168A
Lab 9 Entry	3P138A

Lab 10 Entry	3P142A
Lab 11 Entry	3P148A
Lab 12 & 13 Entry	3P152A
Lab 14 Entry	3P162A
Lab 15 Entry	3P168A
Mic D	2P139A
	2P135A
	2P135BB
	2P153A
	2P157A
	3P139A
	3P135A
	3P135BB
	3P149B
	3P153A
Cell Sort	2P153D
Con Foc	3P159
Cyl Storage	2P167

--- END OF SECTION ---

SECTION 01 31 14
MECHANICAL/ELECTRICAL COORDINATION DRAWINGS USING BIM MODELING

PART 1 - GENERAL

1.1 GOAL DEFINITION

- A. Goal: Production of 'clash free' three dimensional models that meet the design intent expressed in the Contract Documents.
 - 1. See Section 01 00 00, General Requirements, Article "AS-BUILT DRAWINGS".

1.2 EXISTING DIGITAL FILES

- A. Access to digital files used by Architect and his consultants: Section 01 33 23 - Shop Drawings, Product Data, and Samples.

1.3 DEFINITION OF BIM

- A. BIM: In general terms, Building Information Modeling (BIM) is the process by which a project is modeled digitally, incorporating additional information with the primary aim of improving the construction delivery process. This document refers to the 'BIM' or 'Building Information Model' as a singular item; however it is in fact a term that relates to the collection of 3D model files authored by various applications used by the different disciplines/trades. 3D model files will not be Contract Documents, even when prepared by the Architect's Design Team. Use of the Architect's Design Team's model(s) will be at the user's risk and subject to the intellectual property clauses in the Contract Documents.

1.4 GENERAL REQUIREMENTS

- A. The Construction Manager and each Primary trade contractor will utilize Building Information Modeling ("BIM") to:
 - 1. Identify and resolve conflicts with the design intent of the Construction Documents.
 - 2. Produce fabrication and shop drawings.
 - 3. Coordinate construction of the Project and each applicable Subproject.
- B. At the earliest possible date in the performance of the Work, Construction Manager and the Primary Trade Contractors, together with any other trade contractor that will be interacting with or using the BIM information, will meet with Architect's Design Team to develop protocols for developing, implementing, reviewing, and exchanging information through building information models ("BIM Workshop"). Through the BIM Workshop, Construction Manager and Trade Contractors will discuss, coordinate, test and adjust their BIM practices, to allow information to be used, to the greatest practical extent, by the parties for their respective purposes.

1.5 PROJECT PARTICIPANTS

- A. Project Participants - The Project Participants who provide contributions to the coordination drawings provided by the subcontractors include:
1. Management and Oversight Participants:
 - a. Owner
 - b. Architect (studio NOVA)
 - c. Construction Manager
 2. Construction Participants:
 - a. Mechanical Trade Contractor
 - b. Structural Steel Trade Contractor
 - c. Electrical Trade Contractor
 - d. Plumbing Trade Contractor
 - e. Fire Suppression Trade Contractor
 - f. Communications Trade Contractor
 - g. Electronic Safety and Security Trade Contractor
 - h. Pneumatic tube Trade Contractors
 - i. Miscellaneous metal Trade Contractor
 - j. Framing/Drywall/Sheathing Trade Contractor
 3. Secondary Trade Contractors: Secondary Trade Contractors shall attend meetings as necessary to coordinate their work with the other trades. The Primary Trade Contractor related to each particular Secondary Trade Contractor shall be responsible for including Secondary Trade Contractor components in their Construction Models. Secondary Trade Contractors include but are not limited to:
 - a. Temperature or other control systems
 - b. Life safety systems
 - c. Stair Fabricator
 - d. Structural supports, in ceiling cavity, for equipment suspended below ceiling; such as slotted channel framing system that supports a patient lift system.
 - e. Fall Protection

1.6 SCOPE OF WORK

- A. The Construction Manager and each Primary subcontractor will utilize Building Information Modeling ("BIM") to:
1. Create coordinated 'Construction Models' for use as the basis for Shop Drawing's that follow the intent of the design drawings and reflect the coordination/access/maintenance requirements for all systems , are ready for construction including the collaborative identification and resolution of 2D coordination conflicts and relevant physical clashes between 3D Models utilizing Autodesk's Navisworks Manage software.
 2. Although 3D construction modeling processes typically focus on above ceiling coordination, Construction Manager is required to review other congested areas (in addition to above ceiling areas) and create detailed coordination models as necessary to aid the coordination/construction process.
 3. The Architect and his consultants will not be actively involved with the BIM "Construction Model" and coordination meetings. The Architect and his consultants shall have access to the BIM "Construction Model to understand its progress and understand clashes / conflicts in the model.

1.7 BIM/CAD APPLICATIONS

- A. Applications used for creation of Construction Models or Shop Drawings must be directly compatible with Autodesk's Navisworks version 2010 or newer.
- B. Coordination Software:
 - 1. The Coordination Process will utilize Autodesk's Navisworks Manage version 2010 as the software tool to identify and track resolution of clashes between Models.
 - 2. The following details the use and interface of Project Participants with Navisworks Manage in the Coordination Process:
 - a. Models shall be exported to .DWG file format or acceptable other format compatible with Navisworks Manage.
 - b. Each Project Participant shall have their own licensed version of Navisworks Manage to facilitate clash detection and internal coordination of their own Models as well as clash detection and coordination between their own and other Models.
- C. The Construction Manager will provide the following equipment during the Construction Model coordination phase through to the end of the Project:
 - 1. Coordination Computer that meets the recommended requirements (not minimum) published by Autodesk for Navisworks, including ability to back-up the system after each Coordination Meeting.
 - 2. Visual Display Equipment: LCD Projector (OPTIONAL: Dual SmartBoard Setup).

1.8 BIM ROLES AND BASIC RESPONSIBILITIES

- A. Project BIM Leader (s)
 - 1. The Construction Manager will provide a Project BIM Leader who will provide the necessary technical and procedural oversight during the Project to ensure successful delivery of the BIM Management Plan.
- B. The Project BIM Leader is also responsible for the following:
 - 1. Producing a weekly production/coordination progress update to Owner and the Architect's design team.
 - 2. Create, delete, modify and maintain user accounts on designated extranet site.
 - 3. Assign, delete and modify access rights to users to the collaboration site and specific folders.
 - 4. Apply access controls to users so that only authorized users of the Model can access only the data they are authorized to access.
 - 5. Maintain back-ups of site data – a minimum of 2 weeks of daily back-ups is required. Provide off-site physical storage of back-ups and restore data when required.
 - 6. Routinely run information system scans to maintain BIM security.
 - 7. Maintain and monitor information system logs so that only authorized users are accessing the Model and to ensure that there are no functional problems associated with the BIM.
 - 8. Install patches to close documented vulnerabilities in the BIM.
 - 9. Document and report any incident relating to the BIM (including but not limited to an incident originating outside the BIM that results in the BIM being a victim of an attack) and take action to protect the BIM.

-
10. Transfer unconditionally to a successor Project BIM Leader, at such times as directed by Owner, including tangible and intangible property and information, custody or control in their capacity as Project BIM Leader (s).
 11. Provide authorized users with access instructions and system requirements.
 12. Respond to requests by authorized users for assistance in maintaining access.
 13. The Project BIM Leader (s) is responsible for additional aspects typical to managing the designated extranet site, including but not limited to:
 - a. Maintain the most recent version of Contract Documents, Design Models, Construction Models, Coordination Drawings, as well as previous versions in separate sub-folders.
 - b. Post Coordinated Models with Sign-Off of Trade Contractors
 - c. Ensure availability of extranet site 24/7.

1.9 MODEL MANGEMENT/HOSTING

A. Construction Manger's Responsibilities:

1. Management of the construction models, associated drawings, documentation and other contributions will be managed by Construction Manager through to completion of the project.

B. Model Content:

1. The Construction Manager will produce a 'Model Content' table (in a format agreed by studio NOVA) that defines the level of detail in the Construction model, including Trade Contractor contribution, and the As-built model.
2. Construction Manager will require each trade contractor to model their systems during the construction phase as described in the 'Model Content' table, along with the production of any additional models/details required in order to aid the coordination process.

C. Model Parameters & Accuracy - Coordinate System:

1. The 0,0,0 Coordinate or Origin for the Models will be established by Owner at the BIM Kick-Off Meeting.

D. Unit Convention:

1. Models will be created at full scale with the units of measure being Feet and Inches.

E. Two-dimensional Reference Drawings:

1. If a Project Participant creates a two-dimensional reference drawing which is not directly from their Model, then it is their responsibility to verify that the two-dimensional reference drawing is consistent with that of their Model.

F. Design/Building Tolerances:

1. Design models developed by the Architect's design team do not include consideration of tolerance requirements during construction. Construction Manager and trade contractors will add, or make appropriate allowance for those parameters when coordinating between building elements and systems.

1.10 COLLABORATION

A. Model Storage

1. The Project BIM Leader(s) is responsible for establishing, providing access and managing the collaboration Site.
2. A standard file structure naming convention will be utilized with a minimum first level folder as or similar to:
 - a. Contract Documents – this directory holds the Contract Drawings in the format available (DWG, PDF, and/or TIFF) and the Specifications.
 - b. Source Files – this directory holds the most current and previous Construction Model files represented in the Coordination Process.
 - c. Navisworks Master – this directory holds the NWF file for the defined coordination area of the building. The NWF file points to and combines the Current Trade Contractor's Construction Model files in the Source directory within the corresponding coordination Area.
 - d. Issue Log – this directory holds the outputs produced from each Coordination Meeting, including the Constructability Review Log, unresolved clashes, proposed resolutions noted, and decisions made within the meeting. A separate subdirectory should be created for each meeting.
 - e. Coordination Output – this directory holds the final Navisworks model file (Coordinated Federated Model) of an area that has completed the coordination process. This file represents the final output of the coordination process for that particular area, and should match exactly the resulting Coordinated Shop Drawings for that area from the particular Trade Contractors.
 - f. A copy of the sign-off sheet will uploaded when the files are uploaded.
 - g. Each Project Participant shall be responsible for establishing a consistent subfolder structure that follows the Project Coordination Process. Each Project Participant is responsible for maintaining their most current version of the model file in their "Current" subfolder, as well as past versions in dated subfolders.
 - h. A file-naming convention will be established by Owner after the BIM Kick-off Meeting.

1.11 COORDINATION

A. Definitions

1. Design Coordination:
 - a. Prior to bidding the Architect's design team has taken a standard level of care in coordinating architectural components, structural frame and main system runs, to assist in validating that the design will generally fit within the spaces allocated.
2. Construction Coordination:
 - a. Construction Manager and relevant Trade Contractors will produce a fully coordinated model and associated shop drawings that will be free of spatial conflicts, will include agreed to clearances, restrictions, support anchor locations and other requirements to the extent that required spatial information is available and provided by Owner.
 - b. Any changes required to the design must first be approved by the Architect's design team prior to re-routing/coordination.
3. BIM and Field Construction
 - a. Construction Manager's 'Field Procedures' must ensure that field construction is directly based upon the positions/elevations of the 3D model, and Construction Documents, following successful coordination sign-off by the required disciplines,

with construction sequencing that supports the agreed system locations including field verification by Construction Manager personnel.

B. Priority of Interference

1. In general, the following priorities, listed in descending order, exist between Contractors for interference and conflicts in preparing Coordination Drawings:
 - a. Fire Protection heads.
 - b. Recessed ceiling light fixtures.
 - c. HVAC work / Pneumatic tube systems.
 - d. Plumbing work.
 - e. Fire Protection piping.
 - f. Pneumatic Tube work.
 - g. Seismic Bracing for MEP System
 - h. Electrical work.
2. Additionally, lines that pitch have right-of-way over those which do not require pitch. Lines whose elevations cannot be changed have right-of-way over those which can be changed.
3. The above priorities shall not be used unfairly to create hardship or unreasonable burden on the lower ranked work. The priorities are to establish an initial basis for resolution of conflicts.
4. Construction Manager and general trades subcontractors to comment at any time on conditions which adversely affect work under his Contract. Such conditions to be resolved, where possible, among Construction Manager and all subcontractors. Where conditions cannot be resolved, advise Architect; submit proposals for alternative solutions.

C. Coordination - Project BIM Leader: The Project BIM Leader (s) is responsible for:

1. Leading and coordinating the meeting, documenting issues, resolutions, and action items, and operating the clash detection software.
2. Day-to-day coordination between Project Participants can be done via e-mail or other means. Project Participants will cooperate in resolving issues collaboratively.
3. Creation of a coordinated Navisworks Model for each coordination segment.
4. Placing the coordinated Navisworks model file on the extranet site in the appropriate sub-directory for use by Project Participants for their submission and review purposes.

D. Coordination Meeting Preparation: Prior to the meeting the following shall occur:

1. Each Project Participant is to upload their most current Navisworks .NWC file (or other compatible file type) to the extranet folder 2 days before the Coordination Meeting.
2. The Project BIM Leader (s) is then responsible (or assigning responsibility within the team), prior to the Coordination Meeting, for consolidating the files in the Autodesk Navisworks software, verifying that origins are correct and that column lines and elevations align. Any discrepancies in file origins, column lines or elevations must be resolved prior to the Coordination Meeting.
3. Prior to the meeting the Project BIM Leader (s), is responsible for running initial clash detection and prioritizing the clashes to be discussed during the Coordination Meeting.

E. Coordination Meetings:

1. General:
 - a. The Project BIM Leader (s) is responsible for running the meeting, documenting issues, resolutions, and action items, and operating the clash detection software.

-
- b. Day-to-day coordination between Project Participants can be done via e-mail or other means. Project Participants will cooperate in resolving issues collaboratively, with Construction Manager resolving disputes.
 - c. Any deviation from the Contract Documents that may hinder or impede the performance of any system must be documented and accepted through other means (i.e. RFI process).
 - d. A coordinated Navisworks Model will be created by the Project BIM Leader for each coordination segment.
 - e. The coordinated Navisworks .NWD model file will be placed on the extranet site in the appropriate sub-directory for use by Project Participants for their submission and review purposes.
2. The following is typically accomplished in a Coordination Meeting:
- a. Review Status of Past Meeting Clashes – Quick review on the status of clashes identified in the previous meeting using an Issue Tracking Report.
 - b. Clash Discussion – Navigate through each new clash, discussing the issue as a group, and identifying and documenting a resolution.
 - c. Record of agreements will be entered into Navisworks Clash Detective tracking process (or other meeting recording process accepted by Owner), acknowledged by the participants and posted to the extranet site.
 - d. Construction Manager will develop a sign-off process that incorporates appropriate parties.
 - e. At the end of the meeting, review any action items, when the next meeting is scheduled, and next steps required.
 - f. Close Meeting
 - g. Within 24 hours after the meeting, publish a dated (Coordination Meeting date) Navisworks file and post this file to the extranet site in the Issue Tracking folder. This includes posting a dated copy of the Issue Tracking Report to the extranet site.
 - h. Repeat above steps until the coordination segment has been coordinated and Project Participants have resolved their issues in the BIM and associated 2D documentation.
3. Coordination Drawings: Final Coordinated Drawings are to be plotted at a scale of $\frac{1}{4}" = 1'-0"$, minimum and areas of high congestion of materials at a scale of $\frac{1}{2}" = 1'-0"$. Each Project Participant shall be responsible for the cost of printing their Coordinated Drawings.
4. Construction Manager will lead the coordination process including preparation of coordinated shop drawings and submittals required.
5. The coordination process lead by Construction Manager will include allowance for required seismic bracing (separate from allowances for Structural Steel Framing and Cast in Place Concrete), access/maintenance/clearance and installation spaces for the trades and coordination of building systems including those shown in 2D. Where deemed appropriate by Construction Manager, the construction models will include geometric representations of these allowances.
6. Coordination meetings as scheduled on Construction Manager's 'Coordination Meeting Schedule', will be held with sufficient frequency to allow the work to move forward efficiently in time to meet required construction schedule.

1.12 CHANGES

A. Architect's Responsibilities:

- 1. Design changes will either be generated directly in a BIM model or will be created in .PDF sketch format by the Architect's design team and will be forwarded to Construction Manager for subsequent incorporation into the construction model.

2. Architect's design team will continue updating and revising 2D documentation through any permitting process until final approval is granted and subsequent project completion.

B. Construction Manager's Responsibilities

1. Construction Manager will be responsible for incorporating any modifications/re-coordination required following receipt of comments from the Architect's design team through to completion of the Project.

1.13 AS-BUILT

A. Contractor's Responsibilities:

1. Construction Manager will provide a final consolidated As-built Construction Model in the same software format used in the coordination process (Navisworks Manage .NWD)
2. Trade Contractors are responsible for tracking variances between their Construction Models, the 2D contract documents and actual construction in their Construction Model or on the 2D documents and incorporating these changes into the final 'As-built' model and supporting 2D documentation that will be provided as part of their close-out package.

B. Close-Out - The following is to be provided as part of the close-out documentation:

1. Each Trade Contractor will provide a complete and coordinated Construction Model incorporating accepted changes and redline notes/indications on the 2D documents verified during/following field construction within 30 days of completion of their scope of work.
2. Construction Manager will provide to the Owner within 90 days of the project Substantial Completion date:
 - a. Final coordinated Navisworks files of each floor/part of the project included in the BIM process in .NWD format.
 - b. The final coordinated Navisworks files representing each floor consolidated into a single Navisworks file in .NWF format.
 - c. All associated 2D/3D model files in .DWG format (version 2010 or newer)
 - d. All officially issued drawings/specifications/submittals in .PDF format (latest version)

C. Model/File Viewing

1. In order to view the As-built models/files the minimum specification workstation with supporting software is as follows:
 - a. Autodesk Revit version 2010 (or newer version if available)
 - b. Autodesk Navisworks Simulate version 2010 (or newer version if available).
 - c. Autodesk AutoCAD version 2010 (or newer version if available).
 - d. Adobe Acrobat (latest version).
2. Hardware: As defined by Autodesk's 'Recommended' specification for the applications listed above.

1.14 CONTRACTUAL LIMITATIONS

A. BIM Preparation and Use

1. The BIM has been initially prepared as a collaborative effort of design teams working on the Project, and is utilized by STUDIO NOVA, the Architect's design team, Construction Manager and its Trade Contractors as a tool to assist in the design, means, methods, coordination, planning and execution of the work.
2. The BIM is anticipated to be used in a collaborative effort by the Construction Manager Construction Manager and Trade Contractors. The BIM is recognized as computer software based, and subject to the risks inherent in computer software.
3. Use of the BIM is subject to the following terms and conditions:
 - a. Quality Control
 - 1) Construction Manager will exercise access control and quality control regarding the information added to the BIM from Construction Manager and Trade Contractors, including but not limited to, information added from shop drawings, changes and any Construction Manager design-build systems. Construction Manager will continuously update the BIM, destroy or archive outdated versions of the BIM, and maintain suitable records of changes and successive iterations of the BIM model.
 - b. Contractual Significance
 - 1) The BIM is NOT a Contract Document; and does not modify the Contract Documents. In the case of conflict/discrepancies between the BIM (Design Model, Construction Model, or other related BIM) and the Contract Documents, the Contract Documents have precedence.
 - 2) The BIM is not to be relied upon for:
 - a) selecting equipment, materials or systems,
 - b) for dimensions of the Work or
 - c) for dimensioning materials, equipment or systems.
 - 3) Only the permitted Plans and Specifications and any change orders there to, and Construction Manager's own investigations of field conditions, shall be relied on for such purposes.

1.15 SCHEDULE

- A. The BIM Construction Model shall be included in the construction schedule submitted to the Architect.

1.16 SUBMITTALS

- A. Submit in accordance with Section 01 33 23.
- B. Coordination Drawings: Submit within 14 days after BIM Construction Model is substantial complete. Drawings shall be in color for ease of reading the systems shown on the drawings. The coordination drawings for above ceiling conditions shall show all systems above the ceiling and below the bottom of the deck above the ceiling, and show the structural frame. Provide a legend designating the various systems by a color and line types. Include elevations of materials. Drawings shall show location and size of access panels required in walls and ceilings.
- C. Revisions: If revisions occur, submit updated coordination drawings accurately depicting revisions.

1.17 DISTRIBUTION

A. Following approval, distribute copies of coordination drawings to:

1. Job site file.
2. All Prime Contractors.
3. Subcontractors.
4. Architect.
5. Architect's Consultants.
6. Owner.
7. Other concerned parties.

END OF SECTION

SECTION 01 32 16.13
NETWORK ANALYSIS SCHEDULES**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Develop a Network Analysis System (NAS) plan and schedule demonstrating fulfillment of the contract requirements, keep the network up-to-date in accordance with the requirements of this section and utilize the plan for scheduling, coordinating, and monitoring work under this contract (including all activities of subcontractors, equipment vendors, and suppliers). Utilize Conventional Critical Path Method (CPM) Precedence Diagramming Method (PDM) technique to satisfy both time and cost applications. Base all schedule data and reports required under this specification section upon regular total float, not relative total float schedules.
- B. The CPM Schedule shall include at least one (1) Predecessor and one (1) Successor for all scheduling activities except for the very first activity (NTP) and the very last activity (Final Completion).

1.2 CONSTRUCTION MANAGER'S REPRESENTATIVE

- A. Designate an authorized representative in the firm who will be responsible for the preparation of the network diagram, review and report progress of the project with and to the Contracting Officer's representative.
- B. Construction Manager's representative shall have direct project control and complete authority to act on behalf of the Construction Manager in fulfilling the requirements of this specification section and such authority shall not be interrupted throughout the duration of the project.

1.3 CONSTRUCTION MANAGER'S CPM CONSULTANT

- A. Prepare the network diagram, and compact disk(s), which reflects the Construction Manager's project plan, engage an independent CPM consultant who is skilled in the time and cost application of scheduling using (PDM) network techniques for construction projects, the cost of which is included in the Construction Manager's bid. This consultant shall not have any financial or business ties to the Construction Manager, shall not be an affiliate or subsidiary company of the Construction Manager, and shall not be employed by an affiliate or subsidiary company of the Construction Manager.
- B. Prior to engaging a consultant, and within 10 calendar days after award of the contract, submit to the Contracting Officer:
 - 1. The name and address of the proposed consultant.
 - 2. Sufficient information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
 - 3. A list of prior construction projects, along with selected PDM network diagram samples on current projects which the proposed consultant has performed complete project scheduling services. These network diagram samples must show complete project planning for a project of similar size and scope as covered under this contract.
 - 4. This submittal package is only required on the first work package awarded. Any changes to approved consultant after award of the first package will require a new submittal be reviewed and approved by the contracting officer.
- C. Contracting Officer has the right to approve or disapprove employment of the proposed consultant, and will notify the Construction Manager of the VA decision within seven calendar days from receipt of information. In case of disapproval, resubmit another consultant within 10

calendar days for renewed consideration. The Construction Manager must have their CPM Consultant approved prior to submitting any diagram.

1.4 COMPUTER PRODUCED SCHEDULES

- A. Provide to the VA, Senior Resident Engineer and CPM Schedule Analyst, monthly computer processing of all computer-produced time/cost schedules and reports generated from monthly project updates. This monthly computer service will include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of Primavera (P6) to the contracting officer's representative; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data in Primavera (P6) batch format; and the resulting monthly updated schedule in a compressed electronic file in Primavera (P6), (PDM) format. These must be submitted with and substantively support the Construction Manager's monthly payment request and the signed look ahead report. The Resident Engineer shall identify the five different report formats that the Construction Manager shall provide based upon the monthly schedule updates.
- B. The Construction Manager is responsible for the correctness and timeliness of the computer-produced reports. The Construction Manager is also responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.
- C. The VA shall report errors in computer-produced reports to the Construction Manager's representative within - Seven calendar days from receipt of reports. The Construction Manager will reprocess the computer-produced reports and associated compact disk(s), when requested by the Contracting Officer's representative, to correct errors which affect the payment and schedule for the project.

1.5 THE COMPLETE PROJECT NETWORK DIAGRAM SUBMITTAL

- A. Within 45 calendar days (60 calendar days on projects over \$50,000,000, and 90 calendar days on projects over \$150,000,000) after receipt of Notice to Proceed, submit for the Contracting Officer's review; two blue line copy, and one pdf copy of the complete network diagram on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in a compressed Primavera (P6),(PDM) format. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, duration, predecessor and successor relationships, trade code, area code, description, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start and start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer. Make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The Contracting Officer's separate approval of the network diagram shall not excuse the Construction Manager of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working network diagram shall reflect the Construction Manager's approach to scheduling the complete project. The final network diagram in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the Construction Manager's as bid schedule. These changes/delays shall be entered at the first update after the final network diagram has been approved. Provide requests for time and supporting time extension analysis for

contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- B. Within 10 (14 days on packages larger than \$50,000,000) calendar days after receipt of the complete project network diagram, the Contracting Officer or his representative will do one or both of the following:
 - 1. Notify the Construction Manager concerning his actions, opinions, and objections.
 - 2. A meeting with the Construction Manager at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, revise and submit two blue line copies, and one PDF copy of the revised network diagram, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.
- C. The approved baseline network diagram schedule and the corresponding computer-produced schedule(s) shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.
- D. The Complete Project Network Diagram shall contain an appropriate number of work activities/events in order to clearly represent the sequence of the work and in sufficient details for meaningful execution of the full contract work scope..
- E. Each construction package will have a separate Complete Project Network Diagram.

1.6 WORK ACTIVITY/EVENT COST DATA

- A. Cost load all work activities/events except procurement activities. The cost loading shall reflect the appropriate level of effort of the work activities/events. The cumulative amount of all cost loaded work activities/events (including alternates) shall equal the total contract price. Generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. In the event of disapproval, revise and resubmit in accordance with Article, THE COMPLETE PROJECT NETWORK DIAGRAM SUBMITTAL. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.
- B. Cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in the FAR 52.232 – 5 (PAYMENTS UNDER FIXED-PRICE CONSTRUCTION), Article, and VAAR 852.236 – 83 (PAYMENTS UNDER FIXED-PRICE CONSTRUCTION).
- C. In accordance with Article PERFORMANCE OF WORK BY THE CONTRACTOR in FAR 52.236 – 1 and VAAR 852.236 - 72, submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Construction Manager's forces will perform the work.
- D. Cost load work activities/events for ASBESTOS ABATEMENT. The sum of asbestos abatement work activity/event costs shall equal the value of the asbestos bid item in the Construction Managers' bid.
- E. Cost load work activities/events for all BID ITEMS. The sum of the cost loading for each bid item work activities/events shall equal the value of the item in the Construction Managers' bid.

- F. Work activities/events for Construction Manager bond shall have a trade code and area code of BOND.
- G. Profit shall be a single work activity included in the schedule. It shall be billed on the stated percentage basis proportionally with the amount of work in place in each period.
- H. Contractor Overhead from changes shall be a single work activity included in the schedule. It shall be billed on the stated percentage basis proportionally with the amount of work in place for each approved change in each period.
- I. Contractor G&A shall be a single work activity included in the schedule. It shall be billed on the stated percentage basis proportionally with the amount of work in place in each period.
- J. Contractor insurances such as general liability, public liability, pollution, and builders risk shall be single work activities included in the schedule.
- K. Mobilization costs for both the Construction Manager and Subcontractors maybe included as separate work activities.
- L. Shop Drawings that require substantial level of effort to prepare, such as rebar, structural steel, curtain wall, MEP coordination drawings etc., will be individual work activities included in the schedule, and are able to be cost loaded.
- M. BIM and CAD activities will be individual work activities included in the schedule, and are able to be cost loaded.
- N. General Conditions, General Requirements and Logistics Costs shall each be a single work activity included in the schedule. It shall be billed on the stated percentage basis proportionally with the amount of work in place in each period.

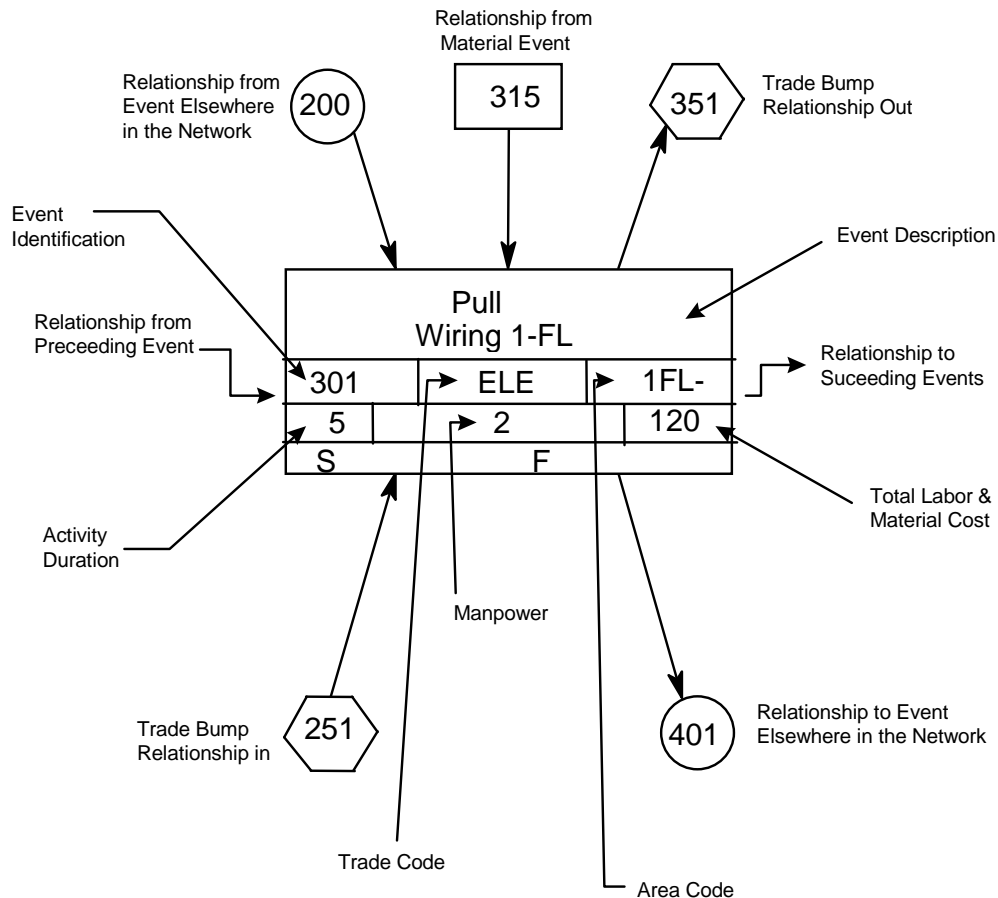
1.7 NETWORK DIAGRAM REQUIREMENTS

- A. Show on the network diagram the sequence and interdependence of work activities/events required for complete performance of all items of work. In preparing the network diagram, the Construction Manager shall:
 - 1. Exercise sufficient care to produce a clear, legible and accurate network diagram, refer to the drawing, CPM-1 (Sample CPM Network). Computer plotted network diagrams shall legibly display and plot all information required by the VA CPM activity/event legend or the computer plotted network diagram will not be acceptable. If the computer plotted network diagram is not found acceptable by the contracting officer's representative, then the network diagram will need to be hand drafted and meet legibility requirements. Group activities related to specific physical areas of the project, on the network diagram for ease of understanding and simplification. Provide a key plan on each network diagram sheet showing the project area associated with the work activities/events shown on that sheet.
 - 2. Show the following on each work activity/event:
 - a. Activity/Event ID number.
 - b. Concise description of the work represented by the activity/event. (35 characters or less including spaces preferred).

- c. Performance responsibility or trade code (five alpha characters or less): GEN, MECH, ELEC, CARP, PLAST, or other acceptable abbreviations. Include these data (Trade and Manpower) in the resource code of P-6 Program for resource planning.
- d. Duration (in work days).
- e. Cost (in accordance with Article, ACTIVITY/EVENT COST DATA of this section and less than \$9,999,999 per activity).
- f. Work location or area code (five characters or less), descriptive of the area involved.
- g. Manpower required (average number of men per day). Include these data (Trade and Manpower) in the resource code of P-6 Program for resource planning.
- h. The SYMBOL LEGEND format shown below and on the drawing, CPM-1 (Sample CPM Network) is mandatory and shall be followed in preparing final network diagrams.

SYMBOL LEGEND

Show Network Diagram page number location(s) for all incoming/outgoing node connector(s).



3. Show activities/events as:
 - a. Construction Manager's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
 - b. Contracting Officer's and Architect's review and approval of shop drawings, equipment schedules, samples, template, or similar items.

- c. Interruption of VA Medical Center utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
- d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
- e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase. Schedule these activities/events so that only one phase is scheduled for completion within the same 14 consecutive calendar day period (except for those phases immediately preceding the final acceptance). Maintain this scheduling condition throughout the length of the contract unless waived by the Contracting Officer's representative in writing.
- f. **Commissioning Activities** - Based upon the project specific Commissioning plan and the specification section 01 91 00, the contractor shall include in the **Day 1 CPM Diagram all the systems commissioning activities (see systems covered in Division 7, 8, 21, 22, 23, 26, 28, 31 and others as specified) as summary level activities. Within 200 days after approval of the Final Day One diagram for the Medical Center Package, Contractor will submit a complete commissioning schedule for the project. This commissioning schedule shall include all the systems commissioning activities (see systems covered in Division 7, 8, 21, 22, 23, 26, 28, 31 and others as specified) such as start up, Pre-functional check list, Pre -test, individual component and system level Functional test, Operator's training, O.& M. Manuals etc.(including any deficiency correction and re-testing). The majority of commissioning activities should be completed as part of the normal construction schedule and finalized prior to the construction contract completion date.** To this end, it is imperative that the Commissioning Agent and the Contractor collaborate to integrate commissioning activities into the Contractor's overall construction schedule. All commissioning activities shall be cost loaded as required in the earlier paragraphs.

The Commissioning Plan will identify critical commissioning activities and associated construction/start up tasks that must precede these activities to allow for successful execution of the commissioning activities. In order to coordinate these activities with the construction schedule, a **Commissioning Duration Schedule** should be provided by the Commissioning Agent to the VA RE and the Contractor to provide a rational basis for integration of commissioning into the detailed commissioning schedule. The Commissioning Duration Schedule should include the following information:

1. Description of Commissioning Activity
2. Prerequisite Construction Tasks Required to Execute the Cx Activity
3. Elapsed Time Duration of Each Activity
4. Documentation Associated with Each Task/Document Responsibility

Once the duration schedule is delivered to the Contractor, the Commissioning Agent will collaborate with the Contractor to refine all commissioning activities into the commissioning schedule in accordance with VA NAS requirements for scheduling the project.

- g. A commissioning schedule will not be required for the early work packages, however, the systems included in the early work packages that require commissioning will be included with the overall commissioning schedule.
 - h. Work activities/events for the asbestos abatement bid item shall have a trade code of ASB.
 - i.. Bid items other than the Base Bid (ITEM 1) and Asbestos Abatement item shall have trade codes corresponding to the appropriate bid item number (e.g., ITM 3, ITM 4 and other items).
4. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
5. Break up the work into activities/events of duration no longer than 20 work days each, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the Contracting Officer may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals, that at the time of initial submission has a total float of 30 days or less shall be 20 work days. The following activities from drawing CPM-1 are the activities/events which will require a duration longer than 20 workdays.
- The following Submittals will require 25 work days for approval:
Doors and Hardware,
- The following Submittals will require 35 working days for approval:
Chillers, Cooling Towers, AHU's larger than 20,000 cfm, Fan Coil Units, Transformers, Medium and High Voltage Switchgears, and Motor Control Centers.
- The following Submittals will require 45 working days for approval:
Elevators
- The construction time as determined by the CPM schedule from early start to late finish for any sub-phase, phase or the entire project shall not exceed the contract time(s) specified or shown.
6. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
7. Uniquely number each activity/event with alpha numeric numbers only. The network diagram should be generally numbered in such a way to reflect discipline, phase or location of the work.

- B. Submit the following supporting data in addition to the network diagram, activity/event ID schedule and electronic file (s). Failure of the Construction Manager to include this data will delay the review of the submittal until the Contracting Officer is in receipt of the missing data:

1. The proposed number of working days per week.

2. The holidays to be observed during the life of the contract (by day, month, and year).
 3. The planned number of shifts per day.
 4. The number of hours per shift.
 5. List the major construction equipment, specifically craneage in excess of 100T operating capacity to be used on the site, describing how each piece relates to and will be used in support of the submitted network diagram work activities/events.
 6. Provide a typed, doubled spaced, description, at least one page in length, of the plan and your approach to constructing the project.
- C. To the extent that the network diagram or any revised network diagram shows anything not jointly agreed upon, it shall not be deemed to have been approved by the Contracting Officer. Failure to include any element of work required for the performance of this contract shall not excuse the Construction Manager from completing all work required within any applicable completion date of each phase regardless of the Contracting Officer's approval of the network diagram.
- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA (Senior Resident Engineer and CPM Schedule Analyst) an electronic file(s) containing one file of the data required to produce a Primavera (P6),(PDM) produced schedule, reflecting all the activities/events of the complete project network diagram being submitted.

1.8 PAYMENT TO THE CONSTRUCTION MANAGER

- A. Monthly, submit the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article FAR 52.232 – 5 (PAYMENTS UNDER FIXED-PRICE CONSTRUCTION), and VAAR 852.236 - 83(PAYMENTS UNDER FIXED-PRICE CONSTRUCTION). The Construction Manager is entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated computer-produced calendar-dated schedule unless, in special situations, the Contracting Officer permits an exception to this requirement. Monthly payment requests shall include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of Primavera (P6), (PDM) to the contracting officer's representative; a listing of all project schedule changes, and associated data, made at the update; and an electronic file (s) of the resulting monthly updated schedule in a compressed Primavera (P6), (PDM) format. These must be submitted with and substantively support the Construction Manager's monthly application and certificate for payment request documents.
- B. When the Construction Manager fails or refuses to furnish to the Contracting Officer the information and the associated updated Primavera (P6), (PDM) schedule in electronic format, which, in the sole judgment of the Contracting Officer, is necessary for processing the monthly progress payment, the Construction Manager shall not be deemed to have provided an estimate and supporting schedule data upon which progress payment may be made.
- C. Prior to approval of the network diagram, the payment process will be administered using the manual payment process. The schedule of values shall be submitted on AIA format and be agreed to prior to submission of the initial billing. This process can occur for a maximum of 3 billing cycles on projects less than \$50,000,000 and a maximum of 5 billing cycles on projects greater than \$50,000,000.

1.9 PAYMENT AND PROGRESS REPORTING

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- A. Monthly job site progress meetings shall be held on dates mutually agreed to by the Contracting Officer (or Contracting Officer's representative) and the Construction Manager. Construction Manager and the CPM consultant will be required to attend all monthly progress meetings. Presence of Subcontractors during progress meeting is optional unless required by the Contracting Officer (or Contracting Officer's representative). Update the project schedule and all other data required by this section shall be accurately filled in and completed prior to the monthly progress meeting. Provide this information to the Contracting Officer or the VA representative in completed form three work days in advance of the progress meeting. Job progress will be reviewed to verify:
1. Actual start and/or finish dates for updated/completed activities/events.
 2. Remaining duration, required to complete each activity/event started, or scheduled to start, but not completed.
 3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the network diagram and computer-produced schedules. Changes in activity/event sequence and duration which have been made pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
 4. Percentage for completed and partially completed activities/events.
 5. Logic and duration revisions required by this section of the specifications.
 6. Activity/event duration and percent complete shall be updated independently.
- B. Submit a narrative report as a part of his monthly review and update, in a form agreed upon by the Construction Manager and the Contracting Officer. The narrative report shall include a description of problem areas; current and anticipated delaying factors and their estimated impact on performance of other activities/events and completion dates; and an explanation of corrective action taken or proposed. This report is in addition to the daily reports pursuant to the provisions of Article, DAILY REPORT OF WORKERS AND MATERIALS in the GENERAL CONDITIONS.
- C. After completion of the joint review and the Contracting Officer's approval of all entries, generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified. Also send an e-file copy of the P6 data to the VA promptly after each monthly update.
- D. After completing the monthly schedule update, the Construction Manager's scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the Construction Manager and Resident Engineer for the contract change(s). When there is a disagreement on logic and/or durations, the consultant shall use the schedule logic and/or durations provided and approved by the Resident Engineer. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the Resident Engineer within fourteen (14) calendar days of completing the regular schedule update. Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.
- E. After VA acceptance and approval of the final network diagram, and upon the request of the Contracting Officers, but no more than once per quarter, submit to the Contracting Officer one blue line copy, and one pdf copy of a revised complete network diagram showing all completed

and partially completed activities/events, contract changes and logic changes made on the intervening updates or at the first update on the final diagram.

- F. Following approval of the CPM schedule, the VA, the Construction Manager, its approved CPM Consultant, RE office representatives, and all subcontractors needed, as determined by the SRE and the Construction Manager, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Construction Manager should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur concurrently with each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

- A. When it becomes apparent from the current monthly progress review meeting or the monthly computer-produced calendar-dated schedule that phasing or contract completion dates will not be met, execute some or all of the following remedial actions:
1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
 2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
 3. Reschedule the work in conformance with the specification requirements.
- B. The Construction Manager may take any of the above listed actions without the approval of the Contracting Officer if no additional cost will be borne by the VA.
- C. Prior to modifying the schedule as a result of any of the above actions, notify and obtain approval from the Contracting Officer for the proposed schedule changes. If such actions are approved, incorporate the CPM revisions into the network diagram before the next update, at no additional cost to the Government.

1.11 CHANGES TO NETWORK DIAGRAM AND SCHEDULE

- A. Within 30 calendar days after VA acceptance and approval of any updated computer-produced schedule, submit a revised network diagram, the associated compact disk(s), and a list of any activity/event changes including predecessors and successors for any of the following reasons:
1. Delay in completion of any activity/event or group of activities/events, indicate an extension of the project completion by 20 working days or 10 percent of the remaining project duration, whichever is less. Such delays which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Construction Manager from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
 2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
 3. The schedule does not represent the actual prosecution and progress of the project.
 4. When there is, or has been, a substantial revision to the activity/event costs of the network diagram regardless of the cause for these revisions.

- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Medical Center, contract phase(s) and sub phase(s), utilities furnished by the Government to the Construction Manager, or any other previously contracted item, must be furnished in writing to the Contracting Officer for approval.
- C. Contracting Officer's approval for the revised network diagram and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA representative.
- D. The cost of revisions to the network diagram resulting from contract changes will be included in the proposal for changes in work as specified in Article, FAR 52.243 -4 (CHANGES), VAAR 852.236 – 88 (CHANGES – SUPPLEMENTS), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the network diagram not resulting from contract changes is the responsibility of the Construction Manager.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Construction Manager shall be supported with a justification, CPM data and supporting evidence as the Contracting Officer may deem necessary for determination as to whether or not the Construction Manager is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Construction Manager has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.
- B. Actual delays in activities/events which, according to the computer-produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Construction Manager in writing of the Contracting Officer's decision.
- C. Submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under Article, FAR 52.243 -4 (CHANGES), VAAR 852.236 – 88 (CHANGES – SUPPLEMENTS). Include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

1.13 CONSTRUCTION SCHEDULE RISK ANALYSIS / MITIGATION PLAN

- A. Schedule Risk Analysis – Conduct the statistical schedule risk analysis based on the above detailed construction activities in the Day 1 approved diagram, identifying major schedule risk areas and recommended risk mitigation plans as outlined below.

- B. The risk analysis shall be conducted by a person or firm skilled in the statistical method of schedule risk analysis based on the (PDM) network techniques for major construction projects, preferably in the major health care related projects. The cost of this service shall be included in the Construction Manager's proposal.
- C. Please submit the name and qualifications of the person or firm within 30 CD of contract award for VA approval. The Contracting Officer has the right to approve or disapprove the Person or firm designated to perform the risk analysis. In case of disapproval, submit another qualified name or firm within 10 CD.

1.14 RISK ANALYSIS FORMAT / REQUIREMENTS / SUBMITTALS

- A. Risk Analysis Software / Format - Within 45 calendar days (60 calendar days on projects over \$50,000,000) after receipt of Notice to Proceed, submit for the Contracting Officer's review; a Risk Analysis software to be utilized, the method of performing the analysis, the format of presenting the data and the reports for VA approval.
- B. Conduct Risk Analysis / Submittals - Based on the approved software / format, the consultant shall perform statistical risk analysis on the detailed approved Day 1 diagram. Review and utilize any previous Risk analysis performed by the A/E of record based on the "semi-detailed" (yet at an overall level) construction logic and schedule to ensure the continuity of previous schedule risk analysis. The Construction Manager's project manager and Superintendent shall identify the major schedule risk areas and possible risk mitigation strategy/plan and record it in a narrative format, with electronic file submission to the VA. The risk analysis exercise shall be performed or updated on a quarterly basis or as directed by the VA Contracting officer.
- C. The submittal shall include three copies of a computer-produced risk analysis results, predicting the various meaningful probability curves of achieving the contract schedules. It shall also include a detailed narrative list of all major and minor potential and specific schedule and cost risk areas, and a Construction Manager's recommendations of mitigating the identified risks which must be addressed by the VA Project and Resident Engineer teams to maintain the contract schedule.

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SECTION 01 33 23
SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

- 1.1 Submit all shop drawings, product data and samples required by Specifications Sections. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- A. Construction Manager's Stamp:
 1. The Contractor's mark or stamp of approval shall indicate in its wording his compliance with the requirements of this Section and the General Conditions.
 2. By approving shop drawings, product data, samples and similar submittals, the Construction Manager represents that the Construction Manager has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
- 1.2 For the purposes of this contract, samples, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1.3 Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
 - A. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;
 - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
 - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1.4 Architect's Digital Data Files: Electronic copies of digital data files the Contract Drawings will be provided by Architect for Construction Manager's use in preparing submittals.
 - A. Architect will furnish Construction Manager one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings. Most of these drawings are in 3D format, but some are in a 2D format.
 1. Digital Drawing Software Program: The Contract Drawings are available in the digital format that the Architect and his consultants used to produce the Construction Documents.
 2. Construction Manager and his "subcontractors" shall execute a data licensing agreement in the form of an Agreement form acceptable to the Owner and Architect.

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3. Data contained on these electronic files shall not be used for any purpose other than as a convenience in the preparation of construction drawings and data for the referenced project. Any other use or reuse shall be at the sole risk of the Construction Manager and without liability or legal exposure to the Government or Architect. Use of information contained in these electronic files is at your sole risk and without liability to Studio NOVA and its consultants. The Contractor shall make no claim and waive to the fullest extent permitted by law, any claim or cause of action of any nature against the Architect, or Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. Defend, indemnify, and hold harmless the Government, Studio NOVA, its consultants and their employees from and against demands, losses, expenses, damages, penalties and liabilities of any kind, including attorney fees, arising out of, or relating to, any use of the electronic files by you or recipients from you.
 4. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings. These electronic CADD drawing files are not construction documents. Differences may exist between the CADD files and the corresponding construction documents. The Government and Architect makes no representation regarding the accuracy or completeness of the electronic CADD files, nor does it make representation to the compatibility of these files with the Construction Managers hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished CADD files, the signed and sealed construction documents shall govern. Determine if any conflict exists. Use of these CADD files does not relieve the Construction Manager of duty to fully comply with the contract documents, including and without limitation, the need to check, confirm and coordinate the work of all trade contractors and subcontractors for the project.
 5. If the digital data drawing files are used by Construction Manager's Architects, Engineers, Consultants, Contractors, Subcontractors or other recipient, then Construction Manager will communicate the conditions in this letter to the using party and hold the using party to the same conditions for use of the electronic files.
 6. If the Construction Manager uses, duplicates and/or modifies these electronic CADD files for use in producing construction drawings and data related to this contract, all previous indicia of ownership (seals, logos, signatures, initials and dates) shall be removed.
- 1.5 Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
- A. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - B. 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.
- 1.6 Submittal Schedule: Prepare and submit a schedule of required submittals including shop drawings, product data, samples, and other specified data. Schedule shall be arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and Contracting Officer and additional time for handling and reviewing submittals required by those corrections.
- A. Update schedule where required by events.

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- B. Avoid simultaneous; close grouping, large quantities, of shop drawings or other voluminous submittals which prevent sufficient review time by the Resident Engineer, Architect, or Architect's consultants.
- C. Submittal schedule is subject to Contracting Officer's review and approval.
- 1.7 Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals will not serve as a basis for extending contract time for completion. Schedule Architect at least 15 working days for review.. Schedule Resident Engineer 20 working days for review. . Architect's and Resident Engineer's review of submittal is concurrent.
- 1.8 Submittals will be reviewed for compliance with contract requirements by Architect, and action thereon will be taken by Resident Engineer on behalf of the Contracting Officer.
- 1.9 A file number will be assigned to submittal as described below. Construction Manager, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1.10 The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefore by Contracting Officer, adjustment in contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.
- 1.11 Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect. However, the Construction Manager shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- 1.12 Submittals must be submitted by Construction Manager only and shipped prepaid, or submitted electronically as described under SUBMITTAL PROCEDURE, below. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.
- A. Submit samples required by Section 09 06 00, SCHEDULE FOR FINISHES, in quadruplicate.
- B. Submit all submittals in quadruplicate, except as follows:
1. Where a greater number is specified.
 2. Mockups: In quantity specified but not less than one.
 3. Electronic Submittals: Submit one copy as specified below.

1.13 SUBMITTAL PROCEDURE

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- B. Electronic Submittals: Construction Manager shall use electronic web site and software provided for two dimensional submittals such as shop drawings, calculations, and product data. Unless indicated otherwise documents shall be submitted in a Portable Document Format (PDF) and reviewable by Adobe Acrobat Pro Version 9. Submittals will be reviewed, commented on, and returned via the same web site and software. Formal procedures regarding this submittal process, review, and signature verification will be reviewed and defined in the Pre-Construction Meeting. All information in this section referring to information required for submittal is required in electronic format if not a material sample submittal.
1. Prepare the submittal for approval by converting it to PDF format acceptable to Adobe Acrobat Pro Version 9, in color.
 2. Resolution of PDF: The finest detail and text shall be legible at 100 percent scale on a 19" monitor.
 3. Scanned submittals will be rejected by reviewer if not legible.
 4. Assemble complete submittal package into a single indexed file.
 5. Specification Section Number- Submittal Number: Name file by Specification Section number followed by shop drawing number. If a submittal is required to be resubmitted it shall be assigned the original shop drawing number designation followed by a decimal point and a sequential number that indicates how many times the shop drawing has been resubmitted for review.
 6. Provide designated space on each shop drawing for insertion to permanently record Construction Manager's review and approval markings, Architect's review and approval markings and Resident Engineer's review and approval markings.
 7. Include the following information on an inserted cover sheet signed by Construction Manager:
 - a. Project name
 - b. Contract number.
 - c. Date.
 - d. Specification Section Number- Submittal Number.
 - e. Name and Address of Resident Engineer.
 - f. Name and address of Architect.
 - g. Name of Construction Manager.
 - h. Name of trade contractor.
 - i. Name of firm or entity that prepared submittal.
 - j. Name of any subcontractor to trade contractor.
 - k. Name of supplier.
 - l. Name of manufacturer.
 - m. Number and title of appropriate Specification Section along with applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item).
 - n. Description of documents sent.
 - o. Location(s) where product is to be installed, as appropriate.
 - p. Related physical samples and color charts submitted directly.
 - q. Other necessary identification.
- C. Catalog cuts and product data shall be marked to indicate specific items submitted for approval.
- D. Options: Identify options requiring selection by the Architect.

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- E. Deviations: Identify deviations from the Contract Documents on submittals.
- F. Professional Engineer: Specification Sections that require a Professional Engineer shall have shop drawings stamped and signed by the Professional Engineer. Prior to submitting electronically, and submit originals as described under "Signatures", below.
- G. Signatures: Submittals that require a signature shall have an original copy sent directly to the Architect and Resident Engineer via first class mail, for Resident Engineer's and Architect's file, on the date the shop drawing is submitted. A copy of the document shall also be included as part of the electronic submission for the Specification Section. Include a transmittal with the following information:
1. Name and address of Architect.
 2. Name of individual in Architect's office that the electronic submittal was sent to.
 3. Project name
 4. Contract number.
 5. Date.
 6. Specification Section Number- Submittal Number
 7. Name of Construction Manager.
 8. Name of Contractor.
 9. Name of Subcontractor.
 10. Description of documents sent.
 11. Name, address, and phone number of individual whose signature is required.
- H. Submittals such as samples and color charts are not acceptable in a PDF format. Construction Manager shall submit samples and color charts directly to the Resident Engineer's Office, concurrently with electronic submittal for specification section or prior to electronic submittal for specification. These submittals will receive consideration only when covered by a transmittal letter signed by Construction Manager. Submittal with cover letter shall be sent via first class mail and shall contain the list of items, name of Medical Center, name of Construction Manager, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
 2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Construction Manager, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
 3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Construction Manager.
- I. In addition to complying with the applicable requirements specified in preceding Article 1.11, samples which are required to have Laboratory Tests (those preceded by symbol "LT" under the separate sections of the specification shall be tested, at the expense of Construction Manager, in a commercial laboratory approved by Contracting Officer.
1. Laboratory shall furnish Contracting Officer with a certificate stating that it is fully equipped and qualified to perform intended work, is fully acquainted with specification requirements and intended use of materials and is an independent establishment in no

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- way connected with organization of Construction Manager or with manufacturer or supplier of materials to be tested.
2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.
 3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory
 4. Construction Manager shall send a copy of transmittal letter to both Resident Engineer and to Architect simultaneously with submission of material to a commercial testing laboratory.
 5. Laboratory test reports shall be sent directly to Resident Engineer for appropriate action.
 6. Laboratory reports shall list contract specification test requirements and a comparative list of the laboratory test results. When tests show that the material meets specification requirements, the laboratory shall so certify on test report.
 7. Laboratory test reports shall also include a recommendation for approval or disapproval of tested item.
- J. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.
- K. Approved samples will be kept on file by the Resident Engineer and become the property of the Government. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work.
- L. Samples sent to the Architect will become property of the Architect. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Construction Manager for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Construction Manager certifying to such check.
1. For each drawing required, submit one legible PDF as described above.
 2. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
 3. A space 6" x 8" shall be reserved on each drawing to accommodate approval or disapproval stamps.
 4. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect at one time.
 5. Submittal Drawings shall include the following:
 - a. Drawing List. List all drawings submitted. List drawing number, title, date, and revision date if applicable.
 - 1) Include Project Identification as specified above.
 - 2) Do not change drawing number for subsequent submittals from original drawing list which would complicate or prevent tracking.
 - b. Show relation to adjacent structure or materials.
 - c. Field dimensions, clearly identified as such.
 6. Construction Manager to receive approval from Resident Engineer if it is believed a sample is too large to ship. These large samples shall be made available for the Architect to review on site.

- 1.14 At the time of transmittal to the Architect, the Construction Manager shall also send a copy of the complete submittal directly to the Resident Engineer.

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- 1.15 Submittals other than electronic submittals for approval shall be sent to Architect-Engineer, in care of Resident Engineer, VA Medical Center, and send one copy directly to Architect at:

Attn: Jim Newby
Studio NOVA
1555 Lake Shore Drive
Columbus, Ohio 43204

1.16 SHOP DRAWINGS

- A. Shop Drawings: Prepare Project-specific information, drawn accurately to scale.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Sheet Index for a Specification Section:
 - 1) When Required: Number of Sheets exceeds 25 for a specification section. Submit index each time shop drawings for a section is submitted.
 - 2) Submit with initial shop drawing submittal for specification Section.
 - 3) Sheet numbers in index shall not repeat same sheet number designation.
 - 4) When index is resubmitted, indicate status on sheet index of previously submitted sheets as Approved, Approved as Noted, Partially Approve as Noted, Not Approved, Reviewed, or Submitted for Approval. Architect and Resident Engineer are not responsible for checking accuracy of the Index. Architect Stamp or Resident Engineer Stamp on Index shall not be construed to mean the information on the Index is correct.
 - b. Identification of products.
 - c. Schedules.
 - d. Compliance with specified standards.
 - e. Notation of coordination requirements.
 - f. Notation of dimensions established by field measurement.
 - g. Relationship and attachment to adjoining construction clearly indicated.
 - h. Seal and signature of professional engineer if section requires a professional engineer.
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 (215 by 280 mm), but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.

1.17 PRODUCT DATA

- A. 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 published 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. Failure to do so is an acceptable reason for Architect to not approve submittal.
3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Color charts.
 - c. Statement of compliance with specified referenced standards.
 - d. Testing by recognized testing agency.
 - e. Application of testing agency labels and seals.
 - f. Notation of coordination requirements.
 - g. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

1.18 SAMPLES

- A. Physical samples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.
- B. Office sample shall be of sufficient size and quantity to clearly illustrate:
 1. Functional characteristics of product or materials with integrally-related parts and attachment devices.
 2. Full range of color samples.

1.19 MOCK-UPS

- A. See Section 01 43 39 - Mockups.

1.20 SAMPLE WARRANTIES

- A. See Section 01 33 25 - Warranties. Submit sample warranties for approval sample copies of all specific warranties required in excess of one year duration.
- B. Submit sample warranties, in excess of one year duration, with related shop drawing submittal. Shop drawing review will not start without warranty submittal nor will they be released for fabrication or installation until sample warranty is approved.

1.21 RESUBMISSION REQUIREMENTS

- A. Shop Drawings:
 1. Review initial drawings as required and resubmit as specified for initial submittals.

2. Indicate on drawings any changes which have been made other than those requested by Architect.

- B. Product Data and Samples: Submit new datum and samples as required for initial submittal.

1.22 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

- A. Make and distribute copies of shop drawings and product datum which carry Architect's stamp to:
 1. Construction Manager's file.
 2. Job site file.
 3. Record documents file.
 4. Construction Manager's prime contractors and subcontractors.
 5. Suppliers and fabricators.

1.23 CONSTRUCTION MANAGER RESPONSIBILITIES

- A. Verify field measurements, field construction criteria and catalog numbers and similar data.
- B. Coordinate each submittal with requirements of work and of Contract Documents.
- C. Deviations/Errors and Omissions:
 1. Construction Manager's responsibility for errors and omissions on submittals is not relieved by Architect's review of submittals.
 2. Construction Manager's responsibility for deviations in submittals from requirements is not relieved by review of submittals, unless Architect gives written acceptance of specific deviations
 3. Notify Contracting Officer and Architect in writing, at time of submission, of deviations in submittals from requirements of Contract Documents.

1.24 ARCHITECT'S DUTIES

- A. Review submittals with reasonable promptness.
- B. Review for:
 1. Design concept of project.
 2. Information given in Contract Documents.
 3. Matters of finish, color and other aesthetic matters left to the Architect's decision by the Contract Documents.
- C. Review of separate item does not constitute review of an assembly in which item functions.
- D. Affix stamp and initials or signature certifying to review of submittal.
- E. Return submittals to Contracting Officer for distribution.

1.25 ARCHITECT'S STAMP

- A. Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately as follows:
1. "Approved": The submittal is approved and no further submittal is required.
 2. "Approved as Noted" (No Resubmission Necessary): The submittal is approved, with minor corrections marked or noted. No further submittal is required, except that if the noted corrections are made on the original by the Construction Manager before distribution, then two copies shall be forwarded to the Resident Engineer and Architect for record.
 3. "Partially Approved As Noted" (Revise and Resubmit as Noted): Portions of the submittal are acceptable and approved, as noted; however, there are other portions which are not approved, or yet to be provided. Those portions not approved or incomplete must be resubmitted as noted. Construction Manager may, at the Construction Manager's discretion and risk, proceed with ordering or installation of the approved portions but must resubmit as noted by the Architect. The submittal, in its entirety, will be approved only upon acceptable submission of non-approved or missing portions, assuming that nothing in the resubmittal conflicts with the previously approved portions.
 4. "Not Approved" (Revise and Resubmit as Noted): This submittal does not meet the requirements of the Contract Documents. Resubmit information on an item, component, or layout that will conform to the requirements of the Contract Documents.
 5. "No Action Required" (For Information Only): This submittal is not required by the Contract Documents, or was provided for information purposes only, or no action has been requested by the Construction Manager. A copy has been retained by the Architect, and a copy is being returned "with no action taken".
 6. "Reviewed Only For:" Only the portions of this submittal which are subject to conformance to a particular A/E discipline's Contract Documents have been reviewed and action taken accordingly. Refer to associated comments as noted for specific A/E review action taken.
- B. Stamp notations which permit fabrication, manufacture and/or construction to proceed, with or without markings, shall not relieve the fabricator, manufacturer, and/or the Construction Manager from any requirement of the Contract Documents or laws which may govern such work.
- C. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- D. Submittals may or may not, at the Architect's discretion, receive stamp or other notation for the following:
1. Submittals not requested.
 2. Calculations.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

--- E N D ---

SECTION 01 33 25
WARRANTIES

PART 1 - GENERAL

RFI 07672: VA Warranty
Contract Name and Address

1.1 GENERAL

- A. Submit warranties for all specific warranties in excess of one year duration required by Specifications Sections. Refer to General Conditions, for additional requirements.
 - 1. Sample Warranties: Warranty submittals to accompany the related shop drawing submittal. Shop drawing review will not start without warranty submittal nor will they be released for fabrication or installation until sample warranty is approved. See Section 01 33 23 for shop drawing submittals.
 - 2. At Owner's option, where manufacturer's warranty provisions are not acceptable, the warranty requirement may be rejected and protection for Owner provided under provisions of the Uniform Commercial Code.
 - 3. Executed Warranties: Submit fully executed warranties as directed by the Resident Engineer.
- B. Warranty Start: Unless otherwise required by the Conditions of the Contract:
 - 1. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.
- C. Warranties submitted for approval need not be fully executed with signatures. Signed warranties are required upon completion of the work and subject to restrictions of payment if not received in the required manner or time.
- D. Obtain executed warranties from suppliers, manufacturers, and trade contractors, and subcontractors as necessary.
- E. Any agreement of manufacturer not complying with terms of warranty is not binding on Owner. The Owner shall be entitled to rights of warranties contained in the Project Manual, implied warranties, and all expressed warranties included in manufacturer's advertising.
- F. Warranties shall conform with the Article "Warranty of Construction", FAR clause 52.246-21, except as specifically extended or otherwise modified in individual specification Sections.

1.2 CONSTRUCTION MANAGER WARRANTIES

- A. In addition to the 1-year "Correction Period" required by law and the General Conditions, certain Sections require extended warranties. Where such extended warranties involve the manufacturer plus Construction Manager, the time limits may be reduced for parties other than the manufacturer as a matter of bonding availability and cost.
- B. The types of work listed below may include the above referenced extended warranties. Refer to specific specification Sections for requirements.
 - 1. Factory applied paint finish.

-
2. Waterproofing.
 3. Building cladding:
 - a. Glass.
 - b. Curtain wall.
 - c. Panels.
 - d. Stone.
 4. Sealants.
 5. Roofing.
 6. Skylights.

1.3 PROHIBITED CONTENT

- A. The following provisions are not acceptable to the Owner and will be deleted.
 1. Limit of warranty provisions to "original Owner". Warranty shall be transferable and remain in effect if ownership of property is transferred by sale or other legal means.
 2. Owner's signature.
 3. Pro-Rated Warranties.
 4. Dollar limits.
 5. Wind speed measured at other than 10 meters above ground level, unless specified otherwise in the Contract Documents.
 6. Wind speed expressed in terms other than miles per hour (mph) or kilometers per hour (kph).

1.4 SAMPLE WARRANTIES

- A. Copies of proposed form prepared by manufacturer or, where applicable, by Construction Manager and subcontractor which sets forth the terms of warranty for the work. Sample or proposed warranty forms to be fully representative of final executed warranty.
- B. All parties associated with the work must be made known and approved by the prime warrantor to preclude claims of unapproved or non-licensed installers, distributors, or subcontractors. Submittal, as prepared by the prime warrantor, must identify the following:
 1. Manufacturer.
 2. Construction Manager.
 3. Subcontractor (if any).
 4. Installer.
 5. Owner.
 6. Job name and address.

1.5 SUBMISSION REQUIREMENTS

- A. Sample Warranties:
 1. Schedule submissions of sample warranties to accompany the related shop drawing submission.
 2. Warranties: Submit number of copies of warranties which Construction Manager requires for distribution plus three (3) copies.

3. Submit in accordance with requirements of Section 01 33 23 - Shop Drawings, Product Data and Samples.
4. Submittals to be stamped by Manufacturer, Construction Manager, Subcontractor, and Installer as applicable.

B. Final Warranties:

1. Submit final executed warranties as directed by the Resident Engineer.
2. Submit "Warranty Status Verification" letter for each warranty issued from manufacturers or entities other than Construction Managers or subcontractors. See WARRANTY STATUS VERIFICATION below.
3. All warranties and warranty status verification letters associated with a particular aspect of work to be combined in one group and stapled together with cover letter.

1.6 RESUBMISSION REQUIREMENTS

A. Review initial warranty and resubmit as specified for initial submittals.

1. Indicate on warranty any changes which have been made other than those requested by Architect.

1.7 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Make and distribute copies of warranties which carry Architect's stamp to:

1. Construction Manager's file.
2. Subcontractor or installer, as applicable.
3. Manufacturer.

1.8 ARCHITECT'S REVIEW

- A. Submittals will be reviewed and treated as a shop drawing. Fabrication or work is not to proceed until warranty submittals are approved by Architect.
- B. Review of warranty submittal does not constitute review of product assembly or warranted item.
- C. Affix stamp and initials or signature certifying to review of submittal.
- D. Return submittals to Construction Manager for distribution.

1.9 WARRANTY STATUS VERIFICATION

- A. Prior to Final Completion and Acceptance, each subcontractor through the Construction Manager to furnish verification from all applicable manufacturers that the warranty(s) issued under his Contract are indeed in full effect and disclaimers regarding payment have been satisfied.
- B. Verification to be on manufacturer's letterhead, signed by an officer with binding contractual authority and notarized.

END OF SECTION

SECTION 01 42 16
DEFINITIONS**PART 1 - GENERAL****1.1 GENERAL****A. General:**

1. Basic Contract definitions are included in the General Conditions.

1.2 DEFINITIONS

1. Owner: The United States Department of Veterans Affairs; also called Department of Veterans Affairs.
2. "Indicated": Requirements expressed in written form, graphic representation, or a combination of written form and graphic representation in the construction documents. Other synonymous terms, including but not limited to, "shown", "noted", "specified", "scheduled", and "as detailed" shall have the same meaning as "indicated".
3. Furnish: The term "furnish" as used in the Contract Documents shall mean to purchase and deliver products to the site ready for installation.
4. Install: The term "install" as used in the Contract Documents shall mean to take furnished products and assemble, erect, secure in place, connect and place in operation as applicable.
5. Provide: The term "provide" as used in the Contract Documents shall mean to furnish, install, and pay all costs in connection therewith.
6. Project Site: The space available for performing construction activities. The extent of the Project Site is shown on the Construction Documents and is may not be the same as property on which the project is built. The Construction Manager shall verify the limits of the Project Site with the Resident Engineer prior to starting work on the Project Site.
7. 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 are similar in material, design, and extent to those indicated for this Project.
8. Date of substantial completion: The date the Resident Engineer determines that the construction of the SLVHCS Replacement Medical Center Project is sufficiently complete, in accordance with the construction documents, for unobstructed use and occupancy by the Owner. This date shall be established in conformance with Clark McCarthy Healthcare Partnership's bid scope for dates and durations.

PART 2 - PRODUCTS**NOT USED****PART 3 - EXECUTION****NOT USED**

END OF SECTION

SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

1. Where the version/edition of a reference or standard is not indicated, follow the most recent version/edition.

1.2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)

- A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to – GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.
- B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

1.3 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM descriptions (FAR 52.211-4) (JUN 1988)

1. The specifications and standards cited in this solicitation can be examined at the following location:
- a. DEPARTMENT OF VETERANS AFFAIRS - Office of Construction & Facilities Management - Facilities Quality Service (00CFM1A) - 811 Vermont Avenue, NW - Room 462 - Washington, DC 20420 - Telephone Numbers: (202) 461-8217 or (202) 461-8292 - Between 9:00 AM - 3:00 PM

1.4 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3) (JUN 1988)

- A. The specifications cited in this solicitation may be obtained from the associations or organizations listed below.

AA Aluminum Association Inc.

	http://www.aluminum.org
AABC	Associated Air Balance Council http://www.aabchq.com
AAMA	American Architectural Manufacturers Association http://www.aamanet.org
AAN	American Nursery and Landscape Association http://www.anla.org
AASHTO	American Association of State Highway and Transportation Officials http://www.aashto.org
AATCC	American Association of Textile Chemists and Colorists http://www.aatcc.org
ACGIH	American Conference of Governmental Industrial Hygienists http://www.acgih.org
ACI	American Concrete Institute http://www.aci-int.net
ACPA	American Concrete Pipe Association http://www.concrete-pipe.org
ACPPA	American Concrete Pressure Pipe Association http://www.acppa.org
ADA	Americans with Disabilities Act. http://www.usdoj.gov/crt/ada/stdspdf.htm
ADC	Air Diffusion Council http://flexibleduct.org
AGA	American Gas Association http://www.aga.org
AGC	Associated General Contractors of America http://www.agc.org
AGMA	American Gear Manufacturers Association, Inc. http://www.agma.org
AHAM	Association of Home Appliance Manufacturers http://www.aham.org
AISC	American Institute of Steel Construction http://www.aisc.org
AISI	American Iron and Steel Institute http://www.steel.org
AITC	American Institute of Timber Construction http://www.aitc-glulam.org
AMCA	Air Movement and Control Association, Inc. http://www.amca.org
ANLA	American Nursery & Landscape Association http://www.anla.org
ANSI	American National Standards Institute, Inc. http://www.ansi.org
APA	The Engineered Wood Association http://www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute http://www.ari.org
ASAE	American Society of Agricultural Engineers http://www.asae.org
ASCE	American Society of Civil Engineers http://www.asce.org
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers http://www.ashrae.org
ASME	American Society of Mechanical Engineers

	http://www.asme.org
ASSE	American Society of Sanitary Engineering http://www.asse-plumbing.org
ASTM	American Society for Testing and Materials http://www.astm.org
AWI	Architectural Woodwork Institute http://www.awinet.org
AWS	American Welding Society http://www.aws.org
AWWA	American Water Works Association http://www.awwa.org
BHMA	Builders Hardware Manufacturers Association http://www.buildershardware.com
BIA	Brick Institute of America http://www.bia.org
BS	British Standards http://www.bsigroup.co.uk/en/
CAGI	Compressed Air and Gas Institute http://www.cagi.org
CGA	Compressed Gas Association, Inc. http://www.cganet.com
CI	The Chlorine Institute, Inc. http://www.chlorineinstitute.org
CISCA	Ceilings and Interior Systems Construction Association http://www.cisca.org
CISPI	Cast Iron Soil Pipe Institute http://www.cispi.org
CLFMI	Chain Link Fence Manufacturers Institute http://www.chainlinkinfo.org
CPMB	Concrete Plant Manufacturers Bureau http://www.cpmc.org
CRA	California Redwood Association http://www.calredwood.org
CRSI	Concrete Reinforcing Steel Institute http://www.crsi.org
CTI	Cooling Technology Institute http://www.cti.org
DHI	Door and Hardware Institute http://www.dhi.org
EGSA	Electrical Generating Systems Association http://www.egsa.org
EEI	Edison Electric Institute http://www.eei.org
EPA	Environmental Protection Agency http://www.epa.gov
ETL	ETL Testing Laboratories, Inc. http://www.et1.com
FAA	Federal Aviation Administration http://www.faa.gov
FCC	Federal Communications Commission http://www.fcc.gov
FPS	The Forest Products Society http://www.forestprod.org
GANA	Glass Association of North America

	http://www.cssinfo.com/info/gana.html
FM	Factory Mutual Insurance http://www.fmglobal.com
GA	Gypsum Association http://www.gypsum.org
GSA	General Services Administration http://www.gsa.gov
HI	Hydraulic Institute http://www.pumps.org
HPVA	Hardwood Plywood & Veneer Association http://www.hpva.org
ICBO	International Conference of Building Officials http://www.icbo.org
ICEA	Insulated Cable Engineers Association Inc. http://www.icea.net
ICAC	Institute of Clean Air Companies http://www.icac.com
IEEE	Institute of Electrical and Electronics Engineers http://www.ieee.org
IMSA	International Municipal Signal Association http://www.imsasafety.org
IPCEA	Insulated Power Cable Engineers Association http://www.icea.net
NBMA	Metal Buildings Manufacturers Association http://www.mbma.com
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc. http://www.mss-hq.com
NAAMM	National Association of Architectural Metal Manufacturers http://www.naamm.org
NAPHCC	Plumbing-Heating-Cooling Contractors Association http://www.phccweb.org
NBS	National Bureau of Standards, See - NIST
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors, http://www.nationboard.org
NEC	National Electric Code, See - NFPA National Fire Protection Association
NEMA	National Electrical Manufacturers Association http://www.nema.org
NFPA	National Fire Protection Association http://www.nfpa.org
NHLA	National Hardwood Lumber Association http://www.natlhardwood.org
NIH	National Institute of Health http://www.nih.gov
NIST	National Institute of Standards and Technology http://www.nist.gov
NLMA	Northeastern Lumber Manufacturers Association, Inc. http://www.nelma.org
NPA	National Particleboard Association 18928 Premiere Court, Gaithersburg, MD 20879 (301) 670-0604
NSF	National Sanitation Foundation http://www.nsf.org
NWWDA	Window and Door Manufacturers Association http://www.nwwda.org
OSHA	Occupational Safety and Health Administration Department of Labor

	http://www.osha.gov
PCA	Portland Cement Association http://www.portcement.org
PCI	Precast Prestressed Concrete Institute http://www.pci.org
PPI	The Plastic Pipe Institute http://www.plasticpipe.org
PEI	Porcelain Enamel Institute, Inc. http://www.porcelainenamel.com
PTI	Post-Tensioning Institute http://www.post-tensioning.org
RFCI	The Resilient Floor Covering Institute http://www.rfci.com
RIS	Redwood Inspection Service, See - CRA
RMA	Rubber Manufacturers Association, Inc. http://www.rma.org
SCMA	Southern Cypress Manufacturers Association http://www.cypressinfo.org
SDI	Steel Door Institute http://www.steeldoor.org
IGMA	Insulating Glass Manufacturers Alliance http://www.igmaonline.org
SJI	Steel Joist Institute http://www.steeljoist.org
SMACNA	Sheet Metal and Air-Conditioning Contractors National Association, Inc. http://www.smacna.org
SSPC	The Society for Protective Coatings http://www.sspc.org
STI	Steel Tank Institute http://www.steeltank.com
SWI	Steel Window Institute http://www.steelwindows.com
TCA	Tile Council of America, Inc. http://www.tileusa.com
TCNA	Tile Council of North America, Inc., See - TCA
TEMA	Tubular Exchange Manufacturers Association http://www.tema.org
TPI	Truss Plate Institute, Inc. 583 D'Onofrio Drive, Suite 200, Madison, WI 53719, (608) 833-5900
UBC	The Uniform Building Code, See ICBO
UL	Underwriters' Laboratories Incorporated http://www.ul.com
ULC	Underwriters' Laboratories of Canada http://www.ulc.ca
WCLIB	West Coast Lumber Inspection Bureau 6980 SW Varns Road, P.O. Box 23145 Portland, OR 97223, (503) 639-0651
WRCLA	Western Red Cedar Lumber Association P.O. Box 120786, New Brighton, MN 55112 (612) 633-4334
WWPA	Western Wood Products Association http://www.wwpa.org

END OF SECTION

SECTION 01 45 24
CONCRETE VAPOR EMISSION & ALKALINITY TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete substrate testing to determine compliance with flooring requirements:
 - a. Relative humidity testing.
 - b. Alkalinity (pH) testing.
2. Corrective work requirements.

B. Related Sections:

1. HVAC Design Data: SECTION 01 11 10 - SUMMARY OF WORK
2. Traffic Coatings: Division 7.
3. Floor coverings and coatings: Division 9.

1.2 TESTING & COST RESPONSIBILITIES

- A. Initial Testing: Perform work of this Section by an independent testing laboratory retained by the applicable flooring trade contractor.
- B. Re-Test: After corrective work has been completed, retesting shall be performed by the same personnel and paid for by the Contractor performing the specified corrective work.
- C. Re-testing and corrective work shall be repeated until acceptable test values are obtained.
- D. Timing and coordination of all testing to be determined by the Contractor.

1.3 REFERENCES (Latest edition unless otherwise noted)

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

1. F 710 Practice for Preparing Concrete Floors to Receive Resilient Flooring.
2. F 1869 Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride, Test Method for.
3. F 2170 Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.4 PERFORMANCE REQUIREMENTS

- A. Requirements for relative humidity in concrete floor slab and alkalinity vary with flooring manufacturers, type of floor covering or coating, adhesive, and location relative to grade. In

general the test values listed below constitute pass/fail unless specifically allowed, in writing, otherwise by flooring manufacturer:

1. Perform tests to determine relative humidity in concrete floor slabs using in situ probes in accordance with ASTM F2170. Proceed with installation only after the relative humidity of concrete is 75 percent relative or lower.
2. pH (Alkalinity) Testing: Not to exceed 9 pH or less than 7 pH; ASTM F 710.

1.5 CORRECTIVE WORK

- A. Corrective work in accordance with Section 07 26 14, Topical Floor Vapor Retarders, is required when test values for slab exceed those specified under PERFORMANCE REQUIREMENTS above unless:

1. Written and signed release furnished by flooring manufacturer for values exceeding above will be warranted, or
2. Flooring manufacturer's published data allows values greater than test values obtained under this Section.

B. Remedies:

1. Preliminary Testing (See SEQUENCING below): Based on test results:
 - a. No Corrective Work Required: Projected moisture is on track to be within acceptable limits by scheduled installation time provided that building temperature, ventilation, and humidity controls are maintained at current levels.
 - b. Corrective Work Required: Projected moisture is not on track to be within acceptable limits by scheduled installation time. Provide one of the following:
 - 1) Supplementary Drying. See SUPPLEMENTARY DRYING under Section 01 51 00, Temporary Utilities.
 - 2) Provide corrective work in accordance with Section 07 26 14, Topical Floor Vapor Retarders.
 - 3) Propose corrective work to remedy the conditions. Submit proposals to Architect and Resident Engineer in writing.
 - 4) Request Change Order for time extension at no additional cost to Owner. Owner is not obligated to issue Change Order and may include liquidated damages if schedule is extended.
2. Pre-Installation Test: Based on test results, provide one of the following:
 - a. Provide corrective work in accordance with Section 07 26 14, Topical Floor Vapor Retarders.
 - b. Propose corrective work to remedy the conditions. Submit proposals to Architect and Resident Engineer in writing.
 - c. Request Change Order for time extension at no additional cost to Owner. Owner is not obligated to issue Change Order and may include liquidated damages if schedule is extended.

- C. Existing Slabs: Owner to bear cost of corrective work for slabs not placed under this Project or contract.

1.6 SUBMITTALS

A. Data:

1. Data Chart: Provide testing data as specified under DATA CHART in Part 3 below.
2. Locations Plan: Locate each test; identify with code which correlates to "Data Chart" above. Minimum scale 1/8" = 1'-0".

B. The independent testing and inspection agency and/or agencies will prepare logs, test reports, and certificates for work under this Section and deliver copies to the parties listed below in such time as not to delay progress on the work, but not more than 7 days after completion of test:

1. Architect: 1 copy.
 - a. Studio NOVA
 - b. 1555 Lake Shore Dr.
 - c. Columbus, OH 43204
 - d. Attn.: Mr. Jim Newby
2. Resident Engineer: 1 copy.
3. Construction Manager: 1 copy.
4. Flooring contractor(s): 1 copy each. Obtain contact information from Construction Manager.

1.7 PROJECT CONDITIONS

A. Concrete to be cured and dry.

B. Space Enclosure and Environmental Limitations: Prior to testing for moisture vapor emission rate, space shall be enclosed, fully weathertight, wet-work in space shall be complete and nominally dry, work above ceilings finished. The test site should be:

1. At the same temperature and humidity expected during normal use.
2. Where this is not possible, provide conditions as follow:
 - a. Air Temperature: Not less than 65 degrees Fahrenheit and not more than 75 degrees Fahrenheit for 72 hours prior to, and throughout the duration of the tests.
 - b. Relative Humidity of Air: Between 40 and 60 percent. Maintain 48 hours prior to, and throughout the duration of the tests.
 - c. Concrete Temperature: Not less than 55 degrees Fahrenheit and not more than air temperature (plus or minus two degrees).

C. Prior to testing for moisture vapor emission rate, curing compounds, sealers, or other films which may interfere with accurate test readings shall be removed.

1.8 SEQUENCING

A. Preliminary Testing: Schedule testing sufficiently in advance of scheduled flooring installation to allow "Corrective Work" if necessary including mobilization for supplementary drying work. Consider 8 weeks to 12 weeks before installation of finish flooring. Note the following:

1. Thicker slabs require longer drying time.

2. Slab drying times dependent on drying conditions and maintaining slab in dry state.
 3. Re-wetting of slab re-starts drying time.
- B. Pre-Installation Testing: Schedule testing not less than 2 weeks or more than 4 weeks before installation of finish flooring.
- C. Re-Test: Schedule testing after the application of corrective work under Section 07 26 14 – Topical Floor Vapor Retarders not less than 4 days after application and not more than 2 weeks prior to flooring installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. **Basis of Design:** Provide commercially manufactured testing equipment by the following:
1. Water Vapor Emission Test Kits: American Moisture Test, Inc., www.DomeTest.com (866) 670-9700 per ASTM F 1869 ~~(no known equal)~~.
 2. Relative Humidity Probes: Factory calibrated in-situ relative humidity probe by Enginus "intellirock" humidity logger, www.engius.com or **"Rapid RH 40" by Wagner Meters, www.wagnermeters.com**, per ASTM F 2170.
 - a. Probes are factory calibrated for 25 uses and must be disposed of after probe expiration.
 3. Digital pH Meter: Wide range 1-14 digital pH meter "pH 100" by Extech per ASTM F 710 as distributed by American Moisture Test, Inc.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify compliance with PROJECT CONDITIONS.
- B. pH (alkalinity) Test: Clean concrete with abrasive cleaner in compliance with Testing Procedures in ASTM F 710.
- C. Remove or verify curing agents have been removed from test areas to allow accurate readings to be obtained.
- D. Relative Humidity: Drill holes per ASTM F 2170 and secure sleeves next to water vapor emission test location.

3.2 TESTS

- A. Water Vapor Emission Test: Test in accordance with ASTM F 1869.
1. See PROJECT CONDITIONS above.
 2. Do not execute tests when building interior does not conform to requirements specified under PROJECT CONDITIONS in Part 1 above.

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3. The number of tests required is determined by the square footage of the facility.
 - a. Three (3) tests are required in areas up to 1,000 square feet for each floor.
 - b. One (1) additional test for each 1,000 square feet thereafter.
 - c. Space test sites approximately equally over the floor area. Do not cluster test sites. Test deepest location of the concrete structure first.
 4. Test includes, but not limited to, the main items listed below. Refer to ASTM F 1869 for exact procedures.
 - a. Weigh anhydrous calcium chloride dishes on site prior to start of exposure. Report scale weight to 0.1 grams and document starting weight and start.
 - b. Place dish on clean dust free surfaces and apply containment dome with preinstalled gasket.
 - c. Retrieve tests 60-72 hours after original installation by carefully cutting through containment dome. Re-install dish cover and seal dish.
 - d. Re-weigh dishes on site, recording weight gain and stop time.
 - e. Calculate and report results as pounds of emission per 1,000 square feet per 24 hours.
- B. Relative Humidity Test: Test in accordance with ASTM F 2170.
1. The number of tests required is determined by the square footage of the facility.
 - a. Three (3) tests are required in areas up to 1,000 square feet for each floor.
 - b. One (1) additional test for each 1,000 square feet thereafter.
 - c. Space test sites approximately equally over the floor area. Do not cluster test sites. Test deepest location of the concrete structure first.
- C. pH (Alkalinity) Testing : Test in accordance with ASTM F 710.
1. Number of Tests: Same as specified for Relative Humidity Test above.
 2. Perform a pH test directly next to hole drilled for Relative Humidity testing.
 - a. Start Testing: 24 hours, minimum, after PREPARATION is complete.
 3. Test includes, but not limited to, the main items listed below. Refer to ASTM F 710 for exact procedures.
 - a. Place several drops of provide testing kit water to concrete surface to form a puddle approximately 1inch in diameter.
 - b. Allow the water to set for approximately 60 seconds.
 - c. Place provided pH paper directly in water and remove immediately
 - d. Compare color change with provided pH chart to determine pH level.
 - e. Record results on testing report.
- D. Marking: Use a non-washable marker to document each test number and date directly on concrete surface for future review. Marking not to be detrimental to bond of floor covering.
- E. Report Results: Use DATA CHART below to document results and issue as a submittal document.
- F. Re-Testing for Work Corrected Under Section 07 26 14:
1. See TESTING AND COST RESPONSIBILITIES and also SEQUENCING; both in Part 1 above.

2. Water Vapor Emission Testing: Re-test corrected work conformance with ASTM F 1869 directly on surface without scarification. .
 - a. Number of Tests:
 - 1) 1 test for each 1,000 square feet or fraction thereof of contiguous treated floor area.
 - 2) Separate areas require separate testing.
 - 3) A minimum of 10 tests are required per project, regardless of size.
3. Relative Humidity Testing: Not required.
4. Alkalinity Testing: Not required.

3.3 DATA CHART

	Moisture Vapor Emission Rate	Alkalinity	Relative Humidity
Grade Level			
High			
Low			
Grade Level			
High			
Low			
	Acceptable 3.0 lbs.	Acceptable - Less than 9.0pH	

Location	Project Name								
	Start	End	Elapsed Time	Start Weight	Ending Weight	Weight Gain	Digital pH	MVER	
	Date/Time	Date/Time							
Grade Level									
Room#									
Room#									
Room#									
Room#									
Room#									
Room#									
Room#									
Room#									

Note: Copies of this chart available by American Moisture Test, Inc. (866) 670-9700

END OF SECTION

SECTION 01 45 29
TESTING LABORATORY SERVICES**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained by Department of Veterans Affairs (Owner).
- B. Definition: Contractor also means Construction Manager or his designated Trade Contractor.

1.2 TESTING AND COST RESPONSIBILITIES

- A. Third Party Inspection and Testing Agency Responsibility:
 - 1. Owner will provide and pay for initial services for testing and inspection required by this Section; see Section 01 00 00, General Requirements, Article "GENERAL INTENTION", Paragraph beginning "Before placement and..."
 - a. Initial services for testing and inspection is defined as the first test, test groups, and test series for each type of test required.
 - b. See Article "FIELD QUALITY CONTROL TESTING FOR FACILITY EXTERIOR ENCLOSURE COMMISSIONING" in PART 3 below for exterior closure testing related to commissioning.
 - 2. Laboratory shall test and/or obtain certificates for tests of materials and methods of construction as described hereinafter:
 - a. Reports: Furnish laboratory test reports of materials and construction; include description of method of test, identification of sample and portion of the work tested, description of location in the work of the sample, time and date of test of sample, weather and climatic conditions, and evaluation of results of tests, including recommendations for action.
 - 3. Inspection services: The inspection agency will have full authority to see that the work is performed in accordance with requirements of the Contract Documents and the directions of the Architect and Resident Engineer. The Inspector shall cooperate with the Construction Manager so as to cause no delay in the progress of the Work, but shall be directly responsible to the Owner for his actions.
 - a. Furnish "Inspection at Site" reports for each visit to the site.
 - 4. Equipment: Furnish all necessary testing equipment; see "Construction Manager Responsibility" below for access.
 - 5. Test Standards: Include a lump sum allowance of \$5,000 for furnishing published standards (AAMA, ASTM, AASHTO, ACI, ANSI, AWS, ASHRAE, UL, etc.) referred to or specifically referenced which are pertinent to any Sections of these specifications. Furnish one set of standards in single copies or bound volumes to the Resident Engineer within 60 days. Photocopies are not acceptable. Billings for the standards furnished shall be at the net cost to Construction Manager. Prior to ordering test standards, submit to Resident Engineer a preliminary list of the test standards, with estimated costs of both electronic and hard copy formats. Obtain Resident Engineer's approval prior to ordering test standards. Provide these documents once.
- B. Construction Manager Responsibility:
 - 1. Non-Compliance: When initial testing services indicate noncompliance with the Contract Documents, any subsequent retesting required by noncompliance and as directed by Resident Engineer shall be performed by either the same testing agency or an

- independent laboratory, as directed by Resident Engineer, and paid for by the Construction Manager.
2. Other Testing:
 - a. Any additional testing required by the Construction Manager to facilitate or expedite construction, the Construction Manager's information or convenience, or for otherwise, such as concrete strength tests required for early removal of forms, etc., shall be paid for by the Construction Manager.
 - b. Construction Manager shall provide all other testing not assigned to Owner in "Third Party Inspection and Testing Agency Responsibility" paragraph above including testing required under Sections in Divisions 2 and higher. Such testing shall be performed by the subcontractor and/or manufacturer to meet certification requirements, Field Quality Control, adhesion testing, daily inspection, etc., and shall be paid for by the subcontractor as part of their work scope.
 3. Schedule portions of the work requiring inspection and testing so that the time of the agency on the project is as continuous and brief as possible.
 4. Regulatory Requirements: Inspections and tests required by codes and ordinances, or by plan approval authorities, and made by a legally constituted authority shall be the responsibility of, and paid for by, the Construction Manager, unless otherwise provided by the Contract Documents.
 5. Access: Provide free, ready access to various parts of the work and assist testing and inspection personnel in the performance of their duties at no additional cost to the Owner.
 - a. For Testing and Inspection of Exterior Closure Commissioning, and similar activities, provide scaffolding, lifts, electric swing stages, potable water, electrical power, and all other staging areas, devices, equipment, utilities, services, and conditions necessary for Third Party Testing Agency to access and perform all inspection and testing required of them.
 6. Data: Furnish records, drawings, certificates, and similar data as may be required by the testing and inspection personnel to ensure compliance with the Contract Documents.
 7. Notice: Furnish notice to Resident Engineer and testing and inspection personnel not less than 24 hours prior to any time required for such services; see Section 01 00 00, General Requirements, Article "GENERAL INTENTION", Paragraph D.
 8. Defective work: The Contractor shall bear all costs of correcting rejected work, including the cost of the Architect's and his consultants' additional services thereby made necessary.
 9. Mock-Ups: All costs associated with construction, inspecting, and performance testing of mock-ups to be paid for by Construction Manager.

1.3 APPLICABLE PUBLICATIONS (latest version unless otherwise indicated)

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Architectural Manufacturers Association (AAMA):

501.1	Standard Test Method for Water Penetration of Windows, Curtain Walls, Doors Using Dynamic Pressure
501.4	Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts
501.5	Test Method for Thermal Cycling Exterior Walls
503	Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazed Systems
- C. American Association of State Highway and Transportation Officials (AASHTO):

T27-06	Sieve Analysis of Fine and Coarse Aggregates
T96-02(R2006)	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
T99-01(R2004)	The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
T104-99(R2003)	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
T180-01(R2004)	Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
T191-02(R2006)	Density of Soil In-Place by the Sand-Cone Method

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

A325-06	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
A370-07	Definitions for Mechanical Testing of Steel Products
A416/A416M-06	Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
A490-06	Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
C31/C31M-06	Making and Curing Concrete Test Specimens in the Field
C33-03	Concrete Aggregates
C39/C39M-05	Compressive Strength of Cylindrical Concrete Specimens
C109/C109M-05	Compressive Strength of Hydraulic Cement Mortars
C138-07	Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
C140-07	Sampling and Testing Concrete Masonry Units and Related Units
C143/C143M-05	Slump of Hydraulic Cement Concrete
C172-07	Sampling Freshly Mixed Concrete
C173-07	Air Content of freshly Mixed Concrete by the Volumetric Method
C330-05	Lightweight Aggregates for Structural Concrete
C567-05	Density Structural Lightweight Concrete
C780-07	Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C1019-08	Sampling and Testing Grout
C1064/C1064M-05	Freshly Mixed Portland Cement Concrete
C1077-06	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
C1314-07	Compressive Strength of Masonry Prisms
D698-07	Laboratory Compaction Characteristics of Soil Using Standard Effort
D1143-07	Piles Under Static Axial Compressive Load
D1188-07	Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D1556-07	Density and Unit Weight of Soil in Place by the Sand-Cone Method
D1557-07	Laboratory Compaction Characteristics of Soil Using Modified Effort
D2166-06	Unconfined Compressive Strength of Cohesive Soil
D2167-94(R2001)	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
D2216-05	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2922-05	Density of soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D2974-07	Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3666-(2002)	Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
D3740-07	Minimum Requirements for Agencies Engaged in the Testing and Inspecting Road and Paving Material
E164-03	Ultrasonic Contact Examination of Weldments
E329-07	Agencies Engaged in Construction Inspection and/or Testing
E543-06	Agencies Performing Non-Destructive Testing

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|-----------------|---|
| E605-93(R2006) | Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members |
| E709-(2001) | Guide for Magnetic Particle Examination |
| E1155-96(R2008) | Determining FF Floor Flatness and FL Floor Levelness Numbers |

- E. American Welding Society (AWS):
D1.1-07 Structural Welding Code-Steel

1.4 REQUIREMENTS

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e. E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Resident Engineer. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Resident Engineer to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to Resident Engineer, Contractor, unless other arrangements are agreed to in writing by the Resident Engineer. Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Resident Engineer immediately of any irregularity.

PART 2 - PRODUCTS (Not Used)

2.1 CONSTRUCTION MANAGER'S RESPONSIBILITY

- A. See "TESTING AND COST RESPONSIBILITIES" in PART 1 above.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:
1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Resident Engineer extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.

2. Provide full time observation of fill placement and compaction and field density testing in building areas and provide full time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with ASTM D698 and/or ASTM D1557.
2. Make field density tests in accordance with the primary testing method following ASTM D2922 wherever possible. Field density tests utilizing ASTM D1556 or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Resident Engineer before the tests are conducted.
 - a. Building Slab Subgrade: At least one test of subgrade for every 6000 square feet of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test for every 6000 square feet of overlaying building slab, but in no case fewer than three tests.
 - b. Foundation Wall Backfill: One test per 100 feet of each layer of compacted fill but in no case fewer than two tests.
 - c. Pavement Subgrade: One test for each 2000 square feet, but in no case fewer than two tests.
 - d. Curb, Gutter, and Sidewalk: One test for each 300 feet, but in no case fewer than two tests.
 - e. Trenches: One test at maximum 100 foot intervals for first and every other 8-inch lift of compacted trench backfill.
 - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to Resident Engineer. In each compacted fill layer below wall footings, perform one field density test for every 100 feet of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.

C. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.

D. Testing Materials: Test suitability of on-site and off-site borrow as directed by Resident Engineer.

3.2 FOUNDATION PILES

- A. Witness load test procedure for conformance with ASTM D1143 and interpret test data to verify geotechnical recommendations for pile capacity. Submit load test report in accordance with ASTM D1143.
- B. Review Contractor's equipment, methods, and procedures prior to starting any work on site. Provide continuous inspection of pile installation. Maintain a record of all pertinent phases of operation for submittal to Resident Engineer.

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- C. All piles are subject to re-inspection at any time, and any pile which fails to conform to Specifications or which have may have been damaged in handling shall be rejected after having Pile Driving Analyzer (PDA) test performed on piles in question.
- D. Clarification of Assignment of Certain Responsibilities:
1. Verification of Driven Pile locations: Contractor shall lay out pile locations according to the Drawings. Testing Laboratory will verify that piles are driven. Contractor shall provide as-built survey documenting elevation of top of each pile and that piles are within specified tolerance including plumbness and exact location.
 2. Testing Laboratory shall witness pile driving and report shall include the following:
 - a. Appearance of plumbness.
 - b. Blow counts.
 - c. PDA tests.
- E. Treated Timber Piles:
- Inspection: Perform inspection at point of treatment and at project site. Mark conforming piles for identification.
1. Logging: Log the driving of all piling and record the following:
 - a. Date driven, type of hammer, pile description including tip, length and butt dimensions measured just prior to driving, pre-drilling size and depth, and any unusual driving conditions.
 - b. Location of pile.
 - c. Number of blows per foot for full length of pile.
 - d. Tip and butt elevation
 - e. Record control elevations provided by Contractor.
 - f. Heaved piles.
 - g. Reporting: Submit driving records daily to Resident Engineer.
 - h. Pile numbering plan as submitted by the Contractor prior to beginning the work.
- F. Steel Pipe Piles:
1. Inspections to certify materials' conformity to details and requirements.
 2. Witnessing and logging all driving operations.
 3. Visually inspect all welding.
 4. Verify that welders are certified for the type of welding being performed.
 5. Steel Piles: Testing agency shall inspect all steel piles prior to installation.
 6. Driving Record: Record all driving of piles. Include date driven, pile location and number, type and size of hammer used, type of driving cushion used, rate of operation of driving equipment, pile description including tip, pile dimensions, elevation of tip, continuous record of number of blows for each foot of penetration, pile deviation and any unusual occurrences during pile driving.
 7. Condition of driving end and installation of anchorage to cap, if required.
 8. Reporting: Submit driving records daily to Resident Engineer.
 9. For concrete fill testing, see 3.7.B herein under "Field Inspection and Material Testing" under "CONCRETE" below.
 10. All Steel Pipe Battered Piles will be PDA Tested.
- G. Prestressed Concrete Piles:
1. Inspection at Plant: Inspect forms, placement of reinforcing steel and strands, placement and finishing of concrete, and tensioning of strands.
 2. Concrete Testing: Test concrete including materials for concrete as required in Article, CONCRETE of this section, except make a minimum of two sets of four (4) cylinders two test cylinders for each day's production of each strength of concrete produced.
 3. Test strand for conformance with ASTM A416/A416M and furnish report to Resident Engineer.

4. Inspect piles to ensure specification requirements for curing and finishes have been met.
5. Reports: Submit a report in quadruplicate to Resident Engineer, for each pile, detailing diameter or cross section, length, predrilling depth, size of drilling bit, make and model of hammer, driving time, blows per minute, number of blows per foot in last 5 feet of penetration, number of blows for each inch during final 6 inches of penetration, and any other pertinent information.
6. High-strain dynamic monitoring shall be performed and reported according to ASTM D4945 during initial driving and during restriking on 12 percent of single piles.

3.3 MONITOR EXISTING STRUCTURE

- A. During Surcharge work monitor the Pan American Building, place monuments on the building and install a Sondex probe and inclinometer to verify that building is not moving, settling, or tilting. Take measurements every 7 days after surcharging of soil is started and continue taking measurements at this interval until the surcharge material is removed. Monument Rulers will be installed by the Earthwork Contractor on the Pan Am Building and will be monitored under this scope of work. See Section 31 20 00 - Earth Moving for description of surcharging.
- B. Monument Rulers: When piles are being driven within 200 feet of the Pan American Building monitor Monument Rulers on the Pan American Building daily and report any changes to Resident Engineer immediately.
 1. Monument Rulers will be installed by others.

3.4 LANDSCAPING

- A. Topsoil testing specified under Section 32 91 18 – Imported Topsoil.

3.5 SITE WORK CONCRETE

- A. Test site work concrete, including materials for concrete, as required in Article CONCRETE of this section.

3.6 POST-TENSIONING OF CONCRETE

- A. Inspection Prior to Concreting: Inspect tendons and/or threadbars, drape of tendons and/or threadbar geometry, sheaths and/or ducts for in-place condition, count, and anchorage components and back-up reinforcement for compliance prior to concreting. See Section 03 38 00 for additional requirements.
- B. Concrete Testing: As required in Article CONCRETE of this Section except make three test cylinders representing each area to be tensioned and cylinders shall be cured in same manner as concrete they represent. Make compression test prior to determining minimum specified strength required for post-tensioning.
 1. Alternatively, other methods approved by Resident Engineer may be used to determine concrete early strength prior to stressing.
 - a. When maturity metering is approved by Resident Engineer, examine system information, and documentation necessary for specific mix, to be able to confirm interpretation of concrete strength based on in-situ temperature measurements.
- C. Post-tensioning: Witness post-tensioning operation and record actual gauge pressures and elongations applied to each tendon and threadbar.
- D. Submit reports in quadruplicate of the following:

1. Inspection of placement and post-tensioning of all tendons.
2. Size, type, number, location, and drape of tendons.
3. Calculated elongations, based upon the length, modulus of elasticity, and cross-sectional area of the tendons used, per the system manufacturer.
4. Actual field elongations. Check elongation of tendons within ranges established by manufacturer.
5. Jack-pump system identifier for each stressing operation.
6. Calculated gauge pressure and jacking force applied to each tendon.
7. Actual gauge pressures and jacking force applied to each tendon.
8. Required concrete strength at time of jacking.
9. Actual concrete strength at time of jacking.
10. Do not cut or cover the tendon ends until the Contractor receives the Resident Engineer's written approval of the post-tensioning records.
11. Stressing Operator's and Inspector's names and initials, and date stressing was conducted.

3.7 CONCRETE

A. Batch Plant Inspection and Materials Testing:

1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of Resident Engineer with concurrence of Contracting Officer and perform periodic inspections thereafter as determined by Resident Engineer.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Resident Engineer.
3. Sample and test mix ingredients as necessary to insure compliance with specifications.
4. Sample and test aggregates daily and as necessary for moisture content. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.
5. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate building site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.

B. Field Inspection and Materials Testing:

1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.
3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least four cylinders for each 50 cubic yards or less of each concrete type, and at least four cylinders for any one day's pour for each concrete type. Label each cylinder with an identification number. Resident Engineer may require additional cylinders to be molded and cured under job conditions. Each set of four cylinders shall be known as a "sample".
 - a. Special Requirements: Specimens shall be:
 - 1) Taken after any addition of water to the concrete mix on the job.
 - 2) Stored while on the job in a moist box as specified under Section 01 52 00 - Construction Facilities & Temporary Controls.
 - 3) Placed in moist box within 10 minutes of molding.

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- 4) Not transported to testing laboratory until initial cure is obtained, nor sooner than 16 hours after molding.
 4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump.
 5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test every truck. For concrete not required to be air-entrained, test once every 100 cubic yards at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
 6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
 7. Record batch and discharge time for every truckload and report this information to Resident Engineer on the same form as entrained air content. Notify Resident Engineer and Construction Manager immediately if concrete time in transit does not conform to ASTM C94.
 8. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
 9. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
 10. Verify that specified mixing has been accomplished.
 11. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
 - a. When ambient air temperature falls below 40 degrees F, record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
 - b. When ambient air temperature rises above 85 degrees F, record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
 12. Inspect forms for clean lines just prior to concrete placement and notify Resident Engineer and Construction Manager of unsatisfactory condition. Submit report if unsatisfactory condition has not been corrected.
 13. Inspect the reinforcing steel placement, including bar size, bar spacing, top, bottom, and side concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
 14. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
 15. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
 16. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
 17. Observe preparations for placement of concrete:
 - b. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
 - c. Inspect preparation of construction, expansion, and isolation joints.
 18. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
 19. Observe concrete mixing:
 - a. Monitor and record amount of water added at project site.
 - b. Observe minimum and maximum mixing times.

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- c. Adding water at site may not be permitted. Refer to specification for the work being installed to verify if permitted.
 - 20. Measure concrete flatwork for levelness and flatness as follows:
 - a. Perform Floor Tolerance Measurements FF and FL in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.
 - b. Perform all floor tolerance measurements within 24 hours after slab installation and prior to removal of shoring and formwork. At areas cured with plastic sheets or paper membrane, floor tolerance tests shall be performed immediately following its removal.
 - c. Provide the Resident Engineer with the results of all profile tests, including a running tabulation of the overall FF and FL values for all slabs installed to date, within 72 hours after each slab installation.
 - 21. Inspect anchor bolts cast into concrete.
 - 22. Inspect concrete formwork for shape, location and dimensions of members.
 - 23. Other inspections:
 - a. Grouting under base plates.
 - b. Grouting anchor bolts and reinforcing steel in hardened concrete.
 - c. Expansion and adhesive anchor installation.
- C. Laboratory Tests of Field Samples:
- 1. Test compression test cylinders for strength in accordance with ASTM C39. For each sample, test one cylinder at 7 days for information and one cylinder at 28 days for acceptance. Use remaining cylinder as a spare tested as directed by Resident Engineer. Compile laboratory test reports as follows: Compressive strength test shall be an average of the compressive strength of two cylinders in the same sample tested at 28 days, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
 - 2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
 - 3. Furnish certified compression test reports (duplicate) to Resident Engineer. In test report, indicate the following information:
 - a. Cylinder identification number and date cast.
 - b. Specific location at which test samples were taken and where the concrete represented by this test, was deposited.
 - c. Type of concrete, slump, and percent air or entrained air content.
 - 1) Percent Air or Entrained Air Content: Match units in specification section applicable to the concrete being installed.
 - 2) If specification for concrete being installed is specified or entrained air content.
 - d. Compressive strength of concrete in psi.
 - e. Weight of lightweight structural concrete in pounds per cubic feet.
 - f. Weather conditions during placing.
 - g. Temperature of concrete in each test cylinder when test cylinder was molded.
 - h. Maximum and minimum ambient temperature during placing.
 - i. Ambient temperature when concrete sample in test cylinder was taken.
 - j. Date delivered to laboratory and date tested.

3.8 REINFORCEMENT

- A. Mill Test Reports: Furnish to, and obtain from, testing agency.
- B. Perform sampling at fabricating plant. Take two samples from each 25 tons or fraction thereof of each size of reinforcing steel No. 3 thru No. 18.

- C. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.
- D. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.
- E. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.
- F. For welded reinforcement, review and approve welder qualifications and welding procedures in accordance with applicable sections of AWS D1.4.

3.9 PRESTRESSED CONCRETE PILES

- A. Inspection at Plant: Forms, placement and concrete cover of reinforcing steel and tendons, placement and finishing of concrete, and tensioning of tendons.
- B. Concrete Testing: Test concrete including materials for concrete required in Article, CONCRETE of this section, except make two test cylinders for each day's production of each strength of concrete produced.
- C. Test tendons for conformance with ASTM A416 and furnish report to Resident Engineer.
- D. Inspect members to insure that specification requirements for curing and finishes have been met.

3.10 PRECAST CONCRETE

- A. Inspection at Plant: Forms, placement of reinforcing steel, concrete cover, and placement and finishing of concrete.
- B. Concrete Testing: Test concrete including materials for concrete as required in Article CONCRETE of this section, except make two test cylinders for each day's production of each strength of concrete produced.
- C. Inspect members to insure specification requirements for curing and finishes have been met.
- D. Inspect all connections for compliance with approved shop drawings.
- E. Inspect all field welds in accordance with "Weld Inspection" under "Fabrication and Erection" under "STRUCTURAL STEEL" below.

3.11 MASONRY

- A. Perform the following services as required to ensure compliance with requirements of Division 4 of the Specifications and Chapter 17 of the IBC.
- B. Inspect and evaluate masonry construction in compliance with 1704.5 and Table 1704.5.3 (Level 2) of the International Building Code.
- C. If testing specified above for masonry stated conflicts with requirements specified below the more stringent requirement shall apply.
- D. Mortar Tests:

1. Laboratory compressive strength test:
 - a. Comply with ASTM C780. All samples shall consist of a set of four cubes.
 - b. Obtain samples during or immediately after discharge from batch mixer.
 - c. Furnish molds with 2 inch, 3 compartment gang cube.
 - d. Test one cube at 7 days and 2 cubes at 28 days.
2. Frequency: Take two samples during first week of operation; one sample per week after initial test until masonry completion.

E. Grout Tests:

1. Laboratory compressive strength test:
 - a. Comply with ASTM C1019. All samples shall consist of four grout prisms 3" x 3" x 6" or taller.
 - b. Test one prism at 7 days and 2 prisms at 28 days.
 - c. Frequency: Take sample for each 2500 square feet of masonry.

F. Masonry Unit Tests:

1. Laboratory Compressive Strength Test:
 - a. Comply with ASTM C140.
 - b. Test 3 samples for each 5000 square feet of wall area.

- G. Prism Tests: For each type of bearing wall construction indicated, test masonry prisms per ASTM C1314 for each 5000 square feet of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3.12 STRUCTURAL STEEL

- A. General: See Section 05 12 00. Provide shop and field inspection and testing services to certify structural steel work is done in accordance with contract documents. Welding shall conform to AWS D1.1 Structural Welding Code.
- B. Prefabrication Inspection:
1. Review design and shop detail drawings for size, length, type and location of all welds to be made.
 2. Approve welding procedure qualifications either by pre-qualification or by witnessing qualifications tests.
 3. Approve welder qualifications by certification or retesting.
 4. Approve procedure for control of distortion and shrinkage stresses.
 5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.
 6. Review materials' proofs of compliance. Identify markings of structural steel shapes to conform to ASTM standards specified. Review structural steel shapes certificates of compliance.
- C. Fabrication and Erection:
1. Weld Inspection:
 - b. Inspect welding equipment for capacity, maintenance and working condition.
 - c. Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.
 - d. Inspect preparation and assembly of materials to be welded for conformance with AWS D1.1.
 - e. Inspect preheating and interpass temperatures for conformance with AWS D1.1.
 - f. Visually inspect and Measure 25 percent of fillet welds.
 - g. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:
 - 1) 20 percent of all shear plate fillet welds at random, final pass only.

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- 2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
 - 3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
 - 4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
 - 5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.
 - h. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.
 - i. Verify that correction of rejected welds are made in accordance with AWS D1.1.
 - j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.
 - k. Owner may perform non-destructive testing, in addition to visual, on any shop or field welds. Owner shall be responsible for all associated costs including handling, surface preparation, and non-destructive testing if the welds are acceptable per AWS D1.1, Section 6, Part C. If the welds are not found to be acceptable, Contractor shall be responsible for repair of discontinuities and all associated costs including those described above.
2. Bolt Inspection:
- a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
 - b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
 - c. Fully Pre-tensioned Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in 25 percent of connections in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
 - d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
 - e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
 - f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.
3. Inspect the application of joint details at each connection for compliance with the construction documents.
- D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Resident Engineer.

3.13 STEEL DECKING

- A. Provide field inspection of welds and ballistic fasteners of metal deck to the supporting steel, and testing services to insure steel decking has been installed in accordance with contract documents and manufacturer's requirements.
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1. Refer to the "Plug Weld Qualification Procedure" in Part 3 "Field Quality Control."

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- C. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.14 SHEAR CONNECTOR STUDS

- A. Provide field inspection and testing services required by AWS D.1 to insure shear connector studs have been installed in accordance with contract documents.
- B. Tests: Test 20 percent of headed studs for fastening strength in accordance with AWS D1.1.
- C. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.15 SPECIAL INSPECTION FOR WIND RESISTANCE

- A. Perform special inspection services as required to ensure compliance with requirements of drawings, specifications, and IBC Sections 1705.4, 1705.4.1, and 1705.4.2.
 - 1. The main wind-force resisting system is the moment frame building structure and does not require additional special inspection for high winds.
 - 2. The special inspections shall include periodic inspection of the following:
 - a. Roof cladding and roof framing connections.
 - b. Connection of Glazed Aluminum Curtain Walls and Aluminum-Framed Entrances and Storefronts to building structure and Cold-Formed Metal Framing.
 - c. Connections of Cold-Formed Metal Framing to structure.
 - d. Connection of Exterior Stone Cladding to support structure.
 - e. Connection of Louvers to support structure.
 - f. Connection of Cementitious Sheathing to Cold-Formed Metal Framing at exterior wall locations receiving Ceramic/Porcelain Tiling system.
 - g. Connection of Metal Clad Fins to support structure.
 - h. Connection of Portland cement plaster furring, including metal lath, to structural support.
- B. Construction Manager, and contractors designated by the Construction Manager, shall comply with IBC Section 1706.

3.16 APPLIED FIREPROOFING

- A. Provide field inspection and testing services to certify sprayed-on fireproofing has been applied in accordance with contract documents; see Section 07 81 00, Applied Fireproofing.
- B. Obtain a copy of approved submittals from Resident Engineer.
- C. Use approved installation in test areas as criteria for inspection of work.
- D. Test sprayed-on fireproofing for thickness and density in accordance with ASTM E605 and bond in accordance with ASTM E 736; ascertain that required resistances have been attained in accordance with IBC including Chapter 17 and Sections 1704.10 and 1704.11. Inspect steel before installation of fireproofing as required by IBC.
 - 1. Bond Strength: The bond strength value shall meet or exceed 100% of the value indicated in manufacturer's product literature approved in accordance with Section 01 33 23, Shop Drawings, Product Data, and Samples.
 - 2. Thickness gauge specified in ASTM E605 may be modified for pole extension so that overhead sprayed material can be reached from floor.

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- E. Test Intervals: Provide testing at not less than the following intervals:
1. Mock-up.
 2. Each floor as completed and prior to installation of mechanical/electrical work which may interfere with testing and/or replacement of fireproofing.
 3. ASTM E 605 unless more frequent testing required by governing Code.
- F. Test Frequency:
1. Thickness: Select one bay per floor, or one bay for each 10,000 square feet of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Metal deck, beam, and column.
 2. Density: Take density determinations from each floor, or one test from each 10,000 square feet of floor area, whichever provides for greater number of tests, from each of the following areas: Underside of metal deck, beam flanges, and beam web.
 3. Bond: Same as "Thickness" above.
- G. Submit inspection reports, certification, and instances of noncompliance to Resident Engineer.

3.17 INTUMESCENT FIREPROOFING

- A. Provide field inspection and testing services to certify fireproofing specified in Section 07 81 23 -Intumescent Fireproofing, has been applied in accordance with contract documents.
- B. Obtain a copy of approved submittals from Resident Engineer.
- C. Use approved installation in test areas as criteria for inspection of work.
- D. Test and inspect in accordance with IBC including Chapter 17 and Section 1704.11. Inspect steel before installation of fireproofing as required by Building Code , and in accordance with TECHNICAL MANUAL 12-B (SECOND EDITION) – Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide, The Association of the Wall and Ceiling Industries – International (AWCI).
1. Frequency of Tests: Not less than one bay per floor, or one bay for each 10,000 square feet of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Beam, column, and metal deck (at least 5 feet from beams).
- F. Perform the tests and inspections of completed Work in successive stages, including MockUp. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- G. Tensile Bond: Select one bay per floor, or one bay for each 10,000 square feet of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Beam, column, and metal deck (at least 5 feet from beam). Test in accordance with ASTM E760.

3.19 GALVANIZED TESTING

- A. Perform the following services as required to ensure compliance with requirements of the following Sections of the Specifications:
1. 03 45 00 Series – Precast Architectural Concrete
 2. 05 40 00 – Cold-Formed Metal Framing.

3. 05 12 00 – Structural Steel.

B. Cold-Formed Galvanized Metal Framing:

1. Perform testing of framing members obtained from field samples.
2. Test for coating weight in accordance with ASTM A90.
3. Should any member test below minimum specification with permissible variations, entire lot shall be rejected; advise Resident Engineer immediately.
4. Test Variability and Retests: In accordance with ASTM A924.

C. Galvanized Steel Field Welds: Furnish inspection during installation of all welds involving structural galvanized steel members.

1. Procedures for all precast connections between galvanized materials must be tested and pre-qualified for the required design carrying capacity.
2. Welding personnel must be pre-qualified in the same welding procedures. A minimum of three tests per connection is required.
3. Check and verify that damaged galvanizing has been repaired as Specified in Section 05 05 15, Hot Dip Galvanizing, prior to being concealed.

3.20 THERMAL AND MOISTURE PROTECTION WORK TESTING AND INSPECTION

- A. Perform the following services as required to ensure compliance with requirements of Division 7 of the Specifications.
- B. Waterproof membrane work: Check surfaces before application of membrane materials and verify that substrate surfaces are in satisfactory condition to receive membrane materials. Furnish continuous inspection during application of membrane and verify that required thicknesses are provided upon completion
- C. Roofing: Check deck surfaces before application of roofing materials and verify that substrate is in satisfactory condition to receive roofing. Verify nailers adequately anchored to structure. Furnish continuous inspection during application of roofing, including application of vapor barriers, insulation and roofing. Inspect all sheet metal flashings, counterflashings and reglets for satisfactory and waterproof installation.
- D. Building Envelope: Insulation at wall and roof plus air barrier. Provide thermographic building survey (thermal imaging) of completed wall and roofing systems following ASTM C1060, C1153, and E1186. Survey to evaluate locations, consistency, and relative state of dryness of insulation, missing insulation, and potential leak sources for water and air, if any. Furnish report of survey which includes photographs, data, and analysis of each area of survey. Verify minimum temperature differential required (normally 40 degrees F).
- E. Intervals as follows plus other times when directed by Resident Engineer:
 1. Exterior Walls: Prior to Substantial Completion and after building enclosure with exterior walls completed and permanent HVAC system operating.
 2. Roof:
 - a. Within 2 months of completion of roof including after building enclosure with exterior walls completed.
 - b. 9 to 11 months and 21 to 23 months after Substantial Completion.
 - c. 4th, 6th, and 9th year after Substantial Completion.
- F. Firestopping: Provide inspection of firestopping for joints and penetrations of rated assemblies in accordance with ASTM E2174; ascertain that required resistances have been attained in accordance with Code requirements. Provide "Destructive inspections as described below.

1. Destructive Inspection After Installation: Inspect a minimum of 2 percent, but not less than one, of each type of fire stop on each floor or for each area of a floor when a floor is larger than 10,000 sq. ft. An area consists of 10,000 sq. ft. or less.
 - a. Remove sufficient amount of firestopping to verify firestopping system complies with designated UL System No.
 - b. Accepted Fire Stops: Installer shall repair accepted fire stops damaged by inspection in accordance with ASTM E2174 at no increased cost to Owner.
2. Document all observed deficiencies on inspection form. Physically identify locations where required fire stop has been omitted or where inspection results indicate the installed fire stop does not comply with the "Inspection Documents" as defined by ASTM E2174; or identification tag is not provide in compliance with Section 07 84 00 – Firestopping.
3. Non-Compliance: Provide the following procedures for non-complying fire stops:
 - a. Destructive Inspection after Installation: Repair or replacement by installer and re-inspection of that fire stop plus one additional inspection of that type fire stop.
 - b. Destructive or Non-Destructive Inspections: If non-compliance occurs on 10% or more of the quantity of like fire stops, then:
 - 1) Inspection of those particular type fire stops shall cease.
 - 2) The installer shall inspect his own work, repair or replace those like fire stops within the area.
 - 3) After corrections have been completed by installer within the area, inspections by the inspector will re-commence.

3.21 FUNGI (MOLD/MILDEW) WORK TESTING AND INSPECTION

- A. Submit unit cost to Resident Engineer for work described in this Article titled "FUNGI (MOLD/MILDEW) WORK TESTING AND INSPECTION".
- B. Perform the following services as directed by the Resident Engineer to ensure interior building materials suspected of becoming wet are free from fungi (mold and mildew). Include gypsum board, paneling, and other designated finish materials.
 1. Cellulosic materials which become food sources for fungi are prime types of materials; however, non-cellulosic materials may harbor active fungi due to dirt including ventilation systems and filters.
 2. Inspection/testing into concealed from view spaces may not be conducted until building is fully enclosed and permanent HVAC system operating.
 3. Testing: Perform laboratory analysis for fungi known to be toxic agents including, but not limited to, Stachybotrys Chartarum, Aspergillus, Penicillium, Fusarium, Trichoderma, and Memnoniella.
- C. Gypsum Board: Inspection openings are required to be cut by the Construction Manager where directed by the Resident Engineer as specified under Section 09 29 00 – Gypsum Board.
- D. Equipment and Other Materials: Use of boroscopes to view concealed spaces in ductwork, walls, partitions, ceilings may be used. Moisture meters may also be used to detect moisture in materials to identify potential sources of fungal growth.
- E. Remediation: Recommend remediation measures in written report to Resident Engineer and Architect. Refer to Section 09 29 00, Gypsum Board, for removal of contaminated board and application of fungicide to interior wall spaces.

3.22 CURTAIN WALL EMBED TESTING

- A. Perform the following services as required to ensure compliance with requirements of the following:
 - 1. Section 08 44 13 – Glazed Aluminum Curtain Walls.
- B. Required Witnesses (besides testing service and installing trade contractor):
 - 1. Curtain Wall Consultant, Architect, Resident Engineer, and Construction Manager.
- C. Field Test: Perform the following field tests of embeds used for support of curtain wall; include welded and cast-in devices. Test in accordance with the cited Standards except as modified, and in accordance with the performance criteria specified under Section 08 44 13 – Glazed Aluminum Curtain Walls. See "Required Witnesses" above.
 - 1. Loads: 1.5 design loads. Dead load applied simultaneously with other loads.
 - 2. Test: With dead load applied, apply live loads perpendicular to slab edge, positive and negative.
 - 3. Standards:
 - a. Application Rate And Time Periods: In accordance with of ASTM E330.
 - b. Load Application: As approved by curtain wall consultant.
- D. Quantity: Perform 5 separate tests as directed by Resident Engineer.

3.23 FIELD QUALITY CONTROL TESTING FOR FACILITY EXTERIOR ENCLOSURE COMMISSIONING

- A. General: Comply with Sections 01 91 00, General Commissioning Requirements, and 07 08 00, Facility Exterior Closure Commissioning, including related Enclosure Testing Matrix.
- B. Wall Systems: During construction, provide field tests of permanent in-place wall systems as described below.
- C. Curtain Wall, Metal Panels, Precast Concrete Wall Panels, and Windows: Perform Water Penetration and Air Leakage Field Testing; coordinate with work of Section 08 44 13, Glazed Aluminum Curtain Wall.
 - 1. Notify Resident Engineer, in writing, a minimum of 14 days prior to conducting the field-testing.
 - 2. Testing Methodology:
 - a. Water Penetration Resistance Testing shall be conducted in accordance with ASTM E1105, Procedure A, consisting of 15 minutes induced air pressure difference.
 - 1) Field Test pressure shall be same test pressure specified in the Performance and Testing Requirements section.
 - 2) Water penetration shall be as specified in the in PERFORMANCE REQUIREMENTS and Section 01 45 29, Mockups.
 - b. Air Leakage Testing shall be conducted in accordance with ASTM E783
 - 1) Test pressure shall be 6.24 psf.
 - 2) Maximum air leakage rate shall be as specified in PERFORMANCE REQUIREMENTS and Section 01 45 29, Mockups.
 - 3. Testing Procedure and Extent:
 - a. Conduct initial field test at designated completed curtain wall area selected by Contracting Officer's as soon as is practical after installation of curtain wall has started. Test early during installation so that errors in fabrication or installation can be found and corrections made before remainder of curtain wall assemblies are installed.

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- 1) As applicable, test area shall include interface with adjacent building envelope systems, as well as typical sill, vertical and horizontal mullions. Test shall include both vision and opaque panels.
 - 2) Test Procedure:
 - a) Initial field test shall include air leakage testing followed by Water Penetration Resistance Testing.
 - b. After initial testing of earliest installation, test one area selected by Contracting Officer prior to completing 10 percent of curtain wall installation, two additional tests prior to completing 30 percent of the glazed wall area and two additional tests prior to completing 50 percent of the glazed wall areas.
 - 1) As applicable, test areas shall include interface with adjacent building envelope systems, as well as typical vertical and horizontal mullions, corner mullions, and typical penetrations through curtain wall. Tests shall include both vision and opaque panels.
 - 2) All tests following initial field test shall be for water penetration resistance only.
 4. Unless otherwise directed by Contracting Officer, each test area shall extend at least 15 feet wide by one story height.
 5. Submit test reports and photographs indicating the procedures and results of all field tests.
- D. Exterior Stone Cladding:
1. Water Hose Tests: Minimum 3 series, AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing for Water Leakage.
 - a. Test Intervals: Test at the approximate intervals of work completions:
 - 1) 5%.
 - 2) 20%.
 - 3) 50%.
 - b. Test Areas: Each test shall include, but not limited to, the following:
 - 1) One area with vertical and horizontal joint.
 - 2) One area at glazed head.
 2. Air Pressure Tests: Not required unless cause of leak cannot be determined from "Water Hose Tests" above. AAMA 501.3 – Field Check of Water and Air Leakage through Installed Exterior Windows, Curtain Walls and Doors by Uniform Air Pressure Difference.
- E. Air and Water Leakage Testing: Coordinate with work of Section 07 27 30, Air Weather Barrier (AWB).
1. Perform quantitative air leakage testing for the building assemblies per ASTM E 779 and the following:
 - a. Test air barrier/vapor retarder assemblies for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
 - b. Testing results not to exceed test pressure differential, positive and negative, indicated in "Performance Requirements" Article for air barrier assembly air leakage according to ASTM E 783.
 2. Water Leakage Testing: Quantitative.
 3. Perform Air and Water Leakage Testing on two (2) floors in each Building A, B, C, D, E, F, G, H, J, M, N, and P.
- F. Water Ponding/Run-Off Test: Coordinate with work of Section 07 52 16, Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing.
1. Apply water to fully cover surface to which roofing has been applied to evaluate drainage.
- G. Envelope and Room Leakage Test.

H. Exterior Vertical Surfaces:

1. Curtain Wall: Tests shall be at least 15 feet wide by one story tall area; test in accordance with ASTM E1105, ASTM E783, and ASTM E1186; test areas in each exposure of each building.
2. Metal Panel: Tests shall be at least 15 feet wide by one story tall; test in accordance with ASTM E1105.
3. Windows: Test in accordance with ASTM E 1105, ASTM E783, and ASTM E1186; test areas in each exposure of each building.
4. System Interfaces: Test curtain wall interfaces in accordance with AAMA 501.2.
5. Precast Architectural Concrete: Tests shall be at least 15 feet wide by one story tall area; test in accordance with ASTM E1105, ASTM E783, and ASTM E1186; test areas in each exposure of each building.
6. Envelope and Room Leakage: Test in accordance with ASTM E779; test 20 percent of floors in each building.

SURFACE	AREA	TEST PANEL AREA	TEST QUANTITY
Curtain Wall	280,000 SF	285 SF / Test Area	10% of area = 96 Tests
Metal Panel	490,000 SF	285 SF / Test Area	5% of area = 86 Tests
Windows	90,000 SF	30 SF / Test Area	5% of area = 150 Tests
Precast Concrete	140,000 SF	285 SF / Test Area	5% of area = 26 Tests
Flashing/End Dams	2860 units	2860 units	2% of units = 80 Tests
Sealant Joints	300,000 LF	5 tests of first 300 LF plus 1 test per 600 LF	= 500 Tests
Air & Water Leakage	12 Buildings @ 2 Floors / Building		= 24 Tests

3.24 CONVEYING SYSTEMS INSPECTION

- A. Perform the following services as required to ensure compliance with requirements of Division 14 of the Specifications.
- B. Elevators:
 1. Test for performance requirements.
 - a. "Performance Standards Matrix New Elevator Installation" with modifications as listed below; NEII-1.
 2. Inspect materials and products supplied.
 - a. Standard Items:
 - 1) Traction: "Checklist for Electric Elevators", ASME A17.2.1a, Appendix A.
 - 2) Hydraulic: "Checklist for Electric Elevators", ASME A17.2.2, Appendix A.

3.25 FIRE PROTECTION INSPECTION AND TESTING

- A. Perform the services required to ensure compliance with requirements of Division 21 of the Specifications.
- B. Other: As specified elsewhere or required by Authorities Having Jurisdiction; see Section 01 00 00, General Requirements, Article "TESTS".

3.26 PLUMBING INSPECTION

- A. Observe and document sterilization of water piping and Storage Tank by Division 22.
- B. Observe and document purging of gas piping.

3.27 OTHERS

- A. Other: As specified elsewhere or required by Authorities Having Jurisdiction; see Section 01 00 00, General Requirements, Article "TESTS".

3.28 TEST QUANTITIES

- A. For quantities of individual tests required to be performed other than the Exterior Closure Tests identified in subparagraph 3.23.H.6 under FIELD QUALITY CONTROL TESTING FOR FACILITY EXTERIOR ENCLOSURE COMMISSIONING article above, is identified in the Veterans Administration "Solicitation/Contract/Order for Commercial Items" documents.

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SECTION 01 56 39
TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
 - 1. Connection of tree protection fencing specified in this section which terminates into temporary construction fencing specified elsewhere.
 - 2. See Section 01 00 00, General Requirements, including the following Articles:
 - a. "ALTERATIONS", including Paragraph beginning, "Protection, Provide the..."
 - b. "PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS".
- B. Related Requirements:
 - 1. Section 01 00 00, General Requirements.
 - 2. Section 01 57 19, Temporary Environmental Controls.
 - 3. Section 01 74 19, Construction Waste Management and Disposal Section.
 - 4. Section 31 20 00, Earth Moving, for removing existing trees and shrubs.
 - 5. Drawing Sheets LT101 and LT102, Tree Protection Plans: For identification numbers assigned to existing trees.

1.2 DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at 6 inches (150 mm) above the ground for trees up to, and including, 4-inch (100-mm) size; and 4.5 feet above the ground for trees larger than 4-inch (100-mm) size or diameter at breast height.
- B. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, as indicated on Drawings.
- C. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of the following:
 - 1. Organic Mulch: 1-quart (1-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
 - 2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
 - 3. Protection-Zone and Tree Identification Signs: Full-size Samples of each size and graphic/message, ready for installation.

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4. Typical Topsoil: Two pounds.
 5. Tree Protection Soil: Two pounds.
 6. Geogrid: 8-1/2" x 11".
 7. Trunk Protection Components.
- C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
1. Tree species and size.
 2. Location on site plan. Include unique identifier for each.
 3. Reason for pruning.
 4. Description of pruning to be performed.
 5. Description of maintenance and management following pruning.
- D. Qualification Data: For qualified arborist and tree service firm.
- E. Certification: From arborist, certifying trees to remain have been protected during construction according to recognized standards and trees were promptly and properly treated and repaired when damaged.
- F. Maintenance and Management Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
1. Include written description of proposed process, methods, and schedule for installation, monitoring, maintaining, and removing temporary tree and plant protection.
- G. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as construction phase damage.
1. Comply with "ALTERATIONS" Article of Section 01 00 00, General Requirements.
 2. Use sufficiently detailed photographs or videotape.
 3. Documentation shall clearly identify existing trees by numbers corresponding to the tree identification numbers assigned on the Drawings (see "Related Requirements" above).
 4. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.4 QUALITY ASSURANCE

- A. Arborist Qualifications: Certified Arborist as certified by International Society of Arboriculture (ISA) and a licensed arborist in jurisdiction where Project is located.
- B. Tree Service Firm Qualifications: Experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project, including experience with mature live oak trees, and that utilizes an experienced, qualified arborist at Project site throughout execution of the Work.
- C. Pre-installation Conference: Conduct conference at Project site.
1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

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- a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
 - b. Enforcing requirements for protection zones.
 - c. Arborist's responsibilities.
 - d. Field quality control.
 - D. Mock-Up: Comply with Section 01 60 00, Product Requirements. Provide mock-up of temporary tree protection for one tree designated by Architect. Modify mock-up as necessary to attain Architect's approval. Attain Architect's approval before proceeding with the remainder of the work. Approved mock-up may be incorporated into the final temporary tree protection work. Retain and maintain mock-up throughout the Work as an example of minimum acceptable quality. Include the following components:
 - 1. Trunk protection.
 - 2. Fencing; at least one gate, one corner post, and two line posts.
 - 3. Geogrid.
 - 4. Mulch.
 - 5. Topsoil.
 - 6. Protection zone sign.
 - 7. Tree identification sign.

1.5 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Vehicle or equipment movement or parking.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
 - 8. Staging construction activities that may compact soil or otherwise negatively affect trees and plants to remain unless approved by Resident Engineer.
- B. Do not direct vehicle or equipment exhaust toward protection zones or tree canopies.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.
- D. Methods, such as climbing spurs, which may damage trees or plants are prohibited.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil:
 - 1. Typical: As specified in 32 91 18 – Imported Topsoil.

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2. Tree Protection Soil: "Nature's Best Organics, Organic Soil Mix (OSM)" by Natural Resources Recovery, Inc., 5800 One Perkins Place Suite 6-A, Baton Rouge, LA 70807, 225 766-1443, www.naturesbestbr.com, or similar mixture comprised of 50 percent aged pine bark, 30 percent aged compost (wood), 10 percent rice hulls, and 10 percent sand.
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of the following:
1. Type: Shredded hardwood excluding bark.
 2. Size: 3 inches (76 mm).
 3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements. Previously used materials may be used when approved by Architect.
1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2 inch (50 mm) opening, 0.148 inch (3.76 mm) diameter wire chain-link fabric; with pipe posts, minimum 2-3/8 inch (60 mm) OD line posts, and 2-7/8 inch (73 mm) OD corner and pull posts; with 1-5/8 inch (42 mm) OD top rails and 0.177 inch (4.5 mm) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
 - a. Height: 6 feet (1.8 m).
 2. Gates: Single swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches (914 mm); automatic latch with keyed lock.
- D. Protection-Zone and Tree Identification Signage: Shop-fabricated; 0.080 inch thick aluminum plates with attachment holes prepunched and reinforced; legibly silk-screen printed with non-fading materials; size(s) as shown on Drawings; graphics/messages in contrasting colors as shown on Drawings.
- E. Geogrid:
1. Description: Extruded, high density polypropylene (HDP) matrix; non-biodegradable; chemically inert; non-elastomeric; roll-good; approximately 13 feet wide by over 200 feet Long. Rated to provide traffic benefit ratio of 4-6 based on AASHTO R 50-09, Standard Practice for Geosynthetic Reinforcement of the Aggregate Base Course of Flexible Pavement Structures, when applied over subgrade at base of aggregate lift.
 2. Product: Tensar "TriAx TX5" or equal by one of the following:
 - a. Tensar International Corporation, 5883 Glenridge Drive, Suite 200, Atlanta, GA 30328-5363; 800 736-7271 phone; www.tensar-international.com.
 - b. Maccaferri Inc., 10303 Governor Lane Boulevard, Williamsport, MD 21795-3116; 301 223-6910 phone; 301 223-6134; www.maccaferri-northamerica.com.
 - c. Nilex Environmental Inc., 15171 East Fremont Drive, Centennial, CO 80112; 303 766-2000 phone; 303 766-1110 fax; www.nilex.com; denver@nilex.com.
 - d. TenCate Geosynthetics, 365 South Holland Drive, Pendergrass, Georgia 30567; 706-693-2226 phone; 706 693-4400 fax; www.tencate.com.
- F. Trunk Protection: Materials in accordance with ANSI A300 Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices (Part 5) Companion Publication "Best Management Practices - Managing Trees During Construction" and as indicated on the Drawings.

- G. Fertilizer: The following ingredients mixed in water according to manufacturer's recommendations:
1. High quality root stimulator. One of the following or equal:
 - a. "Tree Magic" by Nitron Industries, Inc., 5703 S Hewitt, Fayetteville, AR 72704; 800 835-0123.
 - b. "Roots".
 - c. "SUPERthrive®" by Vitamin Institute, 12610 Saticoy Street South, North Hollywood, CA 91605; 800 441-8482 phone; 323 877-5186 phone; 818 766-8482 fax; www.superthrive.com.
 - d. "Root Magic" by SR Life Sciences.
 2. Organic soil conditioner. One of the following or equal:
 - a. "A-35" by Nitron Industries, Inc., 5703 S Hewitt, Fayetteville, AR 72704; 800 835-0123.
 - b. "Bio-Pak Biostimulant" by PHC (Plant Health Care).
 - c. Equal by Global Organics, LLC, 16121 West Eddie Albert Way, Goodyear, AZ 85338; 623 932-1522 phone; www.bioflora.com (Bioflora Systems; Humega).
 3. Mycorrhizal fungus inoculant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Erosion and Sedimentation Control: Examine site to verify temporary erosion- and sedimentation-control measures in place. Verify water flows redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. For record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1 inch (25 mm) vinyl tape of highly visible color (orange, pink, or yellow) around each tree trunk at 54 inches (1372 mm) above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, undermining, or excessive wetting caused by dewatering operations.
- C. Fertilize all trees to remain by way of sub-surface liquid soil injection with injections on three foot spacing grid from dripline or tree protection fence to three feet from tree base. Injections 10-12 inches deep and at 125-150 psi injection pressure.
- D. Tree Number 24: Under canopy, remove (by hand) existing fill sand (approximately 6-12 inches deep) to original grade.

- E. Tree-Protection Zones: Cover roots exposed by demolition and site clearing activities with Tree Protection Soil. Mulch areas inside tree-protection zones and other areas indicated.
 - 1. At Tree Protection Road Mat: See "Tree Protection Road Mat" under "TREE- AND PLANT-PROTECTION ZONES" below.
 - 2. Elsewhere: Apply 4 inch (100 mm) average thickness of organic mulch. Do not place mulch within 12 to 18 inches (150 mm) of tree trunks.

3.3 TREE- AND PLANT-PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on site and construction operations begin in a manner that will prevent equipment, people, and animals from easily entering protected areas except by access gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
 - 1. Chain-Link Fencing: Install to comply with ASTM F 567, Installation of Chain Link Fence, and with manufacturer's written instructions.
 - 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Resident Engineer.
 - a. Prior to setting posts, utilize arborist to field-locate posts. Follow arborist's recommendations, including post locations, to minimize tree root damage.
 - 3. Access Gates: Install where indicated but at least one for each contiguous protection zone (located as directed by Resident Engineer to minimize post quantity and avoid root damage); adjust to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
 - 4. Where tree protection fencing terminates into temporary construction fencing specified elsewhere, connect tree protection fencing to temporary construction fencing posts.
- B. Tree Protection Road Mat (Root Buffer): Lay geogrid loosely over grade; use largest sizes practical to minimize quantity of seams; lap seams according to manufacturer's recommendations. Install organic mulch over geogrid; eight inches thick minimum.
- C. Trunk Protection: Install in accordance with ANSI A300 Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices (Part 5) Companion Publication "Best Management Practices - Managing Trees During Construction" and as indicated on the Drawings.
- D. Protection-Zone and Tree Identification Signage: Install Protection-Zone Signs in visibly prominent locations in manner approved by Architect. Install one Protection-Zone Sign spaced approximately every 35 feet (10.5 m) on protection-zone fencing, but no fewer than four signs for each zone with each facing a different direction; see Drawings for additional locations. Install Tree Identification Signs where indicated.
- E. Maintain protection zones free of weeds and trash.
- F. Throughout duration of the Work, monitor and maintain temporary tree and plant protection, including protection-zone fencing and signage, in good condition as acceptable to Architect.

1. Do not remove or otherwise compromise the protection-zone fencing or gates, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access to protection-zone permitted subject to preapproval in writing by arborist and Architect if root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 31 20 00 - Earth Moving.
- B. Excavation Near Trees (including trenching for new utilities or tie-in, extension, removal, relocation, capping, filling, abandonment, etc., of existing utilities): Hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, pipe jacking, or air spade/knife. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.
- C. Redirect roots in backfill areas where possible. Where large, main lateral roots encountered, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary tree protection soil cover. Water and maintain in moist condition. Temporarily support and protect roots from damage until permanently redirected and covered with soil.

3.5 ROOT PRUNING

- A. Prune broken roots and roots affected by previous activities (including demolition), temporary construction, and permanent construction. Prune roots as follows:
 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 2. Cut Ends: Do not paint cut root ends.
 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 4. Cover exposed roots with burlap and water regularly.
 5. Backfill as soon as possible according to Section 31 20 00 - Earth Moving.
- B. Root Pruning at Edge of Protection Zone: Prune roots flush with edge of protection zone, by cleanly cutting all roots to depth of required excavation.
- C. Root Pruning within Protection Zone: Clear and excavate by hand to depth of required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

- A. Obtain arborist's Crown Pruning recommendations. If recommended by arborist, prune branches affected by temporary and permanent construction as follows:
1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance and management during Contract period as recommended by arborist.
 2. Live Oaks on Banks Street: Prune trees for approximately 15 feet of clearance for proposed buildings and equipment as follows:
 - a. Perform pruning under direction of arborist to ensure optimal aesthetic results.
 3. Pruning Standards: As specifically directed by arborist and according to ANSI A300 Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices (Part 1) Pruning.
 - a. Pruning Types:
 - 1) Cleaning: Clean all Trees to remain. Perform selective pruning to remove dead, diseased, and broken branches two inches in diameter and larger.
 - 2) Raising: Raise Trees Numbers 12 through 18, 20, 21, and 24. Perform selective raising to provide the following vertical clearances:
 - a) For Buildings: 15 feet.
 - b) For Streets: 14 feet.
 - c) For Sidewalks: 8 feet.
 - d) Other: Perform additional pruning for construction as directed by arborist and Architect.
 4. Cut branches with sharp pruning instruments; do not break or chop.
 5. Pruning cuts that remove a branch at its point of origin: Cut close to trunk or parent limb without cutting into branch bark ridge or collar or leaving stub.
 6. When removing dead branch or stub, make final cut just outside of living tissue collar.
 7. Do not apply pruning paint to wounds.
- B. Chip removed branches and dispose of off Owner's property.

3.7 REGRADING

- A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within protection zone.
- B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
1. Root Pruning: Prune tree roots exposed by lowering grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.
- C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond protection zone. Maintain existing grades within protection zone.

- D. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with Tree Protection Soil. Place soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

- A. Inspections: Utilize qualified arborist to direct plant-protection measures in vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 TREE DAMAGE ASSESSMENT

- A. In event of decisive tree damage, as determined by Architect, including, but not limited to, poor health, tree death, tree removal, root zone compaction, and disfigurement such as skinned bark, broken branches, and improper pruning, the Construction Manager's Contract Sum will be reduced by following assigned tree values. If tree damage occurs, the Construction Manager shall determine the responsible contractor(s).

1.	<u>Tree No.</u>	<u>Species</u>	<u>Trunk Dia.</u>	<u>Assessment</u>
	12	Quercus virginiana	50"	\$139,700
	14	Quercus virginiana	33"	\$117,900
	15	Quercus virginiana	35"	\$126,000
	16	Quercus virginiana	40"	\$127,000
	17	Quercus virginiana	50"	\$139,700
	18	Quercus virginiana	30"	\$115,700
	19	Quercus virginiana	33"	\$123,900
	20	Quercus virginiana	28"	\$114,200
	21	Quercus virginiana	38"	\$125,300
	22	Quercus virginiana	29"	\$115,000
	23	Quercus virginiana	31"	\$119,000
	24	Quercus virginiana	35"	\$126,000
	25	Quercus virginiana	29"	\$117,400

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of off Owner's property.
1. See Sections 01 00 00, General Requirements, including Article "DISPOSAL AND RETENTION", and 01 74 19, Construction Waste Management and Disposal.

END OF SECTION

SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS**EP-1. DESCRIPTION**

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
 - 1. Adversely effect human health or welfare,
 - 2. Unfavorably alter ecological balances of importance to human life,
 - 3. Effect other species of importance to humankind, or;
 - 4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- C. Definitions of Pollutants:
 - 1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
 - 2. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 - 3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 - 4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
 - 5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.
 - 6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
 - 7. Sanitary Wastes:
 - a. Sewage: Domestic sanitary sewage and human and animal waste.
 - b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

EP-2. QUALITY CONTROL

- A. Establish and maintain quality control for the environmental protection of all items set forth herein.
- B. Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.
- C. Contractor is responsible for obtaining a storm water pollution prevention permit (SWPPP) with the state of Louisiana prior to construction.

EP-3. REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. U.S. National Archives and Records Administration (NARA):
33 CFR 328 Definitions

EP-4. SUBMITTALS

- A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
 - 1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the Resident Engineer to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the Resident Engineer for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
 - a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
 - b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
 - c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
 - d. Description of the Contractor's environmental protection personnel training program.
 - e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
 - f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
 - g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
 - h. Permits, licenses, and the location of the solid waste disposal area.
 - i. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and the Department of Veterans Affairs.
 - j. Environmental Monitoring Plans for the job site including land, water, air, and noise.
 - k. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.

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- B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

EP-5. PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Resident Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.
1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
 2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques. See Section 01 56 39, TEMPORARY TREE AND PLANT PROTECTION.
 3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
 4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
 - a. Reuse or conserve the collected topsoil sediment as directed by the Resident Engineer.
 - b. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
 5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
 6. Manage borrow areas on Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
 7. Manage and control spoil areas on and off Government property to limit spoil to areas and prevent erosion of soil or sediment from entering nearby water courses or lakes.
 8. Protect adjacent areas from despoilment by temporary excavations and embankments.
 9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
 10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.

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11. Handle discarded materials other than those included in the solid waste category as directed by the Resident Engineer.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
 2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
 3. Monitor water areas affected by construction.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.
- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Louisiana Air Pollution Statute, and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
 2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
 3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Resident Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 7:00a.m. and 6:00p.m. unless otherwise permitted by local ordinance or the Resident Engineer. Repetitive impact noise on the property shall not exceed the following dB limitations. Noise Level readings shall be taken from the property line fence.
- | Time Duration of Impact Noise | Sound Level in dB |
|-------------------------------------|-------------------|
| More than 12 minutes in any hour | 70 |
| Less than 30 seconds of any hour | 85 |
| Less than three minutes of any hour | 80 |
| Less than 12 minutes of any hour | 75 |

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

- a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS,	80	PNEUMATIC TOOLS	80
STATIONARY			
PUMPS	75	BLASTING	N/A
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

- b. Use shields or other physical barriers to restrict noise transmission.
- c. Provide soundproof housings or enclosures for noise-producing machinery.
- d. Use efficient silencers on equipment air intakes.
- e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
- f. Line hoppers and storage bins with sound deadening material.
- g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 50 feet from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at three to six feet in front of any building face. Submit the recorded information to the Resident Engineer noting any problems and the alternatives for mitigating actions.

- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.

- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

--- E N D ---

SECTION 01 58 16
TEMPORARY INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies temporary interior signs.

PART 2 - PRODUCTS

2.1 TEMPORARY SIGNS

- A. Fabricate from 50 Kg (110 pound) mat finish white paper.
- B. Cut to 100 mm (4-inch) wide by 300 mm (12 inch) long size tag.
- C. Punch 3 mm (1/8-inch) diameter hole centered on 100 mm (4-inch) dimension of tag. Edge of Hole spaced approximately 13 mm (1/2-inch) from one end on tag.
- D. Reinforce hole on both sides with gummed cloth washer or other suitable material capable of preventing tie pulling through paper edge.
- E. Ties: Steel wire 0.3 mm (0.0120-inch) thick, attach to tag with twist tie, leaving 150mm (6-inch) long free ends.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install temporary signs attached to room door frame or room door knob, lever, or pull for doors on corridor openings.
- B. Mark on signs with felt tip marker having approximately 3 mm (1/8-inch) wide stroke for clearly legible numbers or letters.
- C. Identify room with numbers as designated on floor plans.

3.2 LOCATION

- A. Install on doors that have room, corridor, and space numbers shown.
- B. Doors that do not require signs are as follows:
1. Corridor barrier doors (cross-corridor) in corridor with same number.
 2. Folding doors or partitions.

3. Toilet or bathroom doors within and between rooms.
4. Communicating doors in partitions between rooms with corridor entrance doors.
5. Closet doors within rooms.

C. Replace missing, damaged, or illegible signs.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:

1. Standards.
2. Quality Assurance.
3. Building Equipment/Systems Warranty
4. Delivery, Storage, and Handling.
5. Manufacturers and Types.
6. Metal Gages.
7. Fabrication.
8. Shop Priming.

C. Related Sections:

1. Cutting/Patching & Sleeves: Section 01 73 29.
2. Submittal Procedures: Section 01 33 23.
3. Execution Requirements: Section 01 73 00.

1.2 STANDARDS

A. Standards, codes, and regulations published by Manufacturers' associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements.

1. Where no date or edition is referenced, such references include the latest issue and all amendments up to 30 days prior to the Bid due date.
2. Where specific date or edition is referenced, that issue shall apply.

B. "Governing Authority" means all federal, state, and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most stringent requirements shall take precedence.

D. Supply all materials and perform all Work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and Manufacturers' association standards, unless specifically noted otherwise herein.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Wind Load: Provide products designed to withstand the indicated wind load or greater load if required by Code; when requested, submit substantiating data.

2. Fire Resistance Rating:
 - a. Provide materials and assemblies which have been tested and listed by UL, FM, or other recognized authority, for the assembly shown or specified; where specified, attach label of testing authority.
 - b. For oversized assemblies or assemblies similar to those tested, provide Manufacturer's certification that the assembly has been constructed of materials and methods equivalent to the tested construction.
 3. Flame Spread Rating:
 - a. Provide products with the indicated flame spread rating or less; when requested, submit substantiating data.
 - b. Provide materials with flame spread rating required by code, unless a more stringent requirement is specified.
 4. Names of Manufacturers and Trade Names:
 - a. Manufacturers and trade names indicated on drawings and/or in specifications are basis of design, and not intended to limit competition. Products by other manufacturers that conform to the requirements of the drawings and specifications are acceptable.
 5. Qualifications of Subcontractor:
 - a. Submit satisfactory evidence that Subcontractor has a minimum of 5 years' successful experience in Work similar to the Work and Scope of this Contract.
 - b. Subcontract the Work to a firm licensed, franchised or otherwise approved by the Manufacturer.
 6. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Installer/Applicator/Erector: Construction Manager or another entity engaged by Construction Manager as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- C. Field Quality Control:
1. Manufacturer's Field Representative:
 - a. When indicated, provide a qualified technical representative at the project site to advise on the proper installation of the product.
 2. Mock-up and Test Surface:

-
- a. Where indicated, construct a field mock-up or sample panel, using materials, finishes, colors, jointing fasteners, and methods of installation proposed for the Work.
 - b. When applying materials as a finish or protective coating to other surfaces, apply to a test surface of the actual base material.
 - c. Do not proceed without Architect's approval.
3. Field Measurements:
- a. Make field measurements wherever possible for accurate fabrication of built-in or attached products.
 - b. Do not delay job progress. Allow for trimming where field measurements cannot be made prior to fabrication.
 - c. Coordinate with work of other Sections:
 - 1) 01 00 00, General Requirements, Article "LAYOUT OF WORK".
 - 2) 01 71 23, Field Engineering, Article "LAYOUT".
4. Layout:
- a. Establish bench marks and layouts as required. Extend these lines up through the Building as the Work progresses. Each Subcontractor shall lay out his Work from these references.
 - b. Coordinate with work of other Sections:
 - 1) 01 00 00, General Requirements, Article "LAYOUT OF WORK".
 - 2) 01 71 23, Field Engineering, Article "LAYOUT".
- D. Conflicting Requirements
1. Referenced Standards: 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 conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 2. 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.

1.4 TESTS, INSPECTIONS, AND APPROVALS

- A. See Section 01 73 00 - Execution Requirements.

1.5 INFORMATION REQUESTS

- A. See Section 01 73 00 - Execution Requirements.

1.6 NON-CONFORMING WORK

- A. See Section 01 73 00 - Execution Requirements.

1.7 DELIVERY, HANDLING, AND STORAGE

A. General:

1. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
2. See GENERAL SEQUENCING in Section 01 11 10 – Summary of Work-General.

B. Delivery:

1. Schedule delivery to minimize long-term storage at site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged or sensitive to deterioration, theft, and other losses.
3. Deliver products to 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 upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products at site in a manner that will facilitate inspection and measurement of quantity or counting of units.
2. Store heavy materials away from Project structure in a manner that will not endanger supporting construction.
3. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity with range required by manufacturer's instructions.
4. Materials subject for formation of mold or mildew (organic and paper-faced products such as gypsum wallboard) must be stored inside conditioned weathertight spaces, and maintained in a dry condition. Where these types of materials have become wet, remove from jobsite and replace with new, dry, conforming materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND TYPES

- A. Where no Manufacturer is listed, submit through the Shop Drawing procedure the name of the Manufacturer, the product proposed, and detailed information showing its characteristics. Such proposal shall meet the Specification, line item by line item, or will be rejected.
- B. The color, finish, and textures specified in Section 09 06 00, Schedule for Finishes, shall be considered custom. Provide specified color, finish, and texture; or color, finish, and textures matching specified colors, finish, and textures acceptable to Architect. Unless indicated otherwise the finished face of sample shall be a minimum of 4" x 4" (100mm x 100mm). Provide a minimum of four copies of each sample.
- C. Where a choice of color, pattern, or texture is not specified in Section 09 06 00, Schedule for Finishes, for a specified product or item of equipment, the Architect/Owner will make a selection from the Manufacturer's highest or best standards, unless noted otherwise in the specification

sections of Divisions 2 and up of the Project Manual. Provide four samples of each color, texture and pattern available to allow the Architect to make the selection, color charts are not acceptable. Unless indicated otherwise the finished face of sample shall be a minimum of 4" x 4" (100mm x 100mm).

- D. Company Ownership Change: Where control or ownership of a company which produces a specified product changes, whether through sale, merger, or other acquisition, the following conditions apply:
1. The Specified product as produced by the acquiring company is subject to review by Architect to evaluate compliance with specifications and deviation from quality level from version produced by the acquired company.
 2. If after such review, Architect approves the specified product, such approval does not confer upon nor imply approval of any other products of the acquiring company.

2.2 METAL GAGES

- A. Unless noted otherwise, metal thickness specified by gages without decimal equivalents to be based on standards referenced below.
- B. Carbon Steel: U.S. Standard Gage as published in AISI Manual of Steel Construction, 9th Edition. Gages specified, but not listed, to comply with referenced standard.
1. 12 gage: 0.1046 inch
 2. 14 gage: 0.0747 inch
 3. 16 gage: 0.0598 inch
 4. 18 gage: 0.0478 inch
 5. 20 gage: 0.0359 inch
 6. 22 gage: 0.0299 inch
 7. 24 gage: 0.0239 inch
 8. 26 gage: 0.0179 inch
 9. 28 gage: 0.0149 inch
- C. Other Metals: Architectural Sheet Metal Manual by SMACNA, 6th Edition, 2005.
- D. Thickness indicated is base metal, exclusive of coatings.

2.3 FABRICATION

- A. Fabricate all items in the shop insofar as possible. Where items cannot be completely shop-fabricated and assembled for shipment, assemble and fit in shop, disassemble and ship. Identify parts for field assembly.
- B. Fabricate items to be straight, square, in proper alignment, and with hairline joints where joints are necessary. Pre-plan field joints to be as inconspicuous as possible.

2.4 SHOP PRIMING

- A. Shop prime or seal surfaces of all products to receive paint materials in accordance with the requirements in the Painting Section of these Specifications.

- B. Apply a primer or sealer compatible with the specified paint materials.
- C. In the event such primer is determined to be incompatible with the specified paint materials, provide a barrier coat or remove the primer and reprime as directed.

2.5 SMALL FASTENERS

- A. *All small fasteners which are exposed inside secure areas of building to be tamper resistant and require special tools to remove.
 - 1. *Screws/Bolts: Spanner head, "Torx" head or equal.
 - 2. Bolts up to 3/8 inch diameter: Button head socket cap or approved equal.

END OF SECTION