

SECTION 09 05 16

SUBSURFACE PREPARATION FOR FLOOR FINISHES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies subsurface preparation requirements for areas to receive the installation of applied and resinous flooring. This section includes testing concrete for moisture and pH, remedial floor coating for concrete floor slabs having Unsatisfactory moisture or pH conditions as required.

1.2 RELATED WORK

- A. Section 07 92 00, JOINT SEALANTS.
B. 09 65 19, RESILIENT TILE FLOORING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA and TEST DATA.
- B. Written approval confirming product compatibility with subfloor material manufacturer and the flooring manufacturer
- C. Product Data:
1. Moisture remediation system
 2. Underlayment Primer
 3. Cementitious Self-Leveling Underlayment
 4. Cementitious Trowel-Applied Underlayment (Not suitable for resinous floor finishes)
- D. Test Data:
1. Moisture test and pH results performed by a qualified independent testing agency or warranty holding manufacturer's technical representative.

1.4 DELIVERY AND STORAGE

- A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.
B. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):

D638-10 (2010)	Test Method for Tensile Properties of Plastics
D4259-88 (2012)	Standard Practice for Abrading Concrete to alter the surface profile of the concrete and to remove foreign materials and weak surface laitance.
C109/C109M-12 (2012)	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens) Modified Air Cure Only
D7234-12 (2012)	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

E96/E96M - 12 (2012)	Standard Test Methods for Water Vapor Transmission of Materials
F710-11 (2011)	Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
F1869-11 (2011)	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
F2170-11 (2011)	Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
C348-08 (2008)	Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
C191-13 (2013)	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

PART 2 - PRODUCTS

2.1 MOISTURE REMEDIATION COATING

- A. System Descriptions:
 - 1. High-solids, epoxy system designed to suppress excess moisture in concrete prior to an overlayment. For use under resinous products, VCT, tile and carpet where issues caused by moisture vapor are a concern.
- B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.
- C. System Components: Verify specific requirements as systems vary by manufacturer. Verify build up layers and installation method. Verify compatibility with substrate. Use manufacturer's standard components, compatible with each other and as follows:
 - 1. Liquid applied coating:
 - a. Resin: epoxy.
 - b. Formulation Description: Multiple component high solids.
 - c. Application: Per manufacturer's written installation requirements.
 - d. Thickness: minimum 10 mils
- D. Material Vapor Permeance: Application shall achieve a permeance rating of less than 0.1 perm in accordance with ASTM E96/E96M.
- E. Maximum RH requirement: 100% testing in accordance with ASTM F2170.

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	SCAMD Rule 1113	25 grams per liter

Permeance	ASTM E96	0.1 perms
Tensile Modulus	ASTM D638	1.9X10 ⁵ psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufacture's Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

2.2 CEMENTITIOUS SELF-LEVELING UNDERLAYMENT

- A. System Descriptions:
 - 1. High performance self-leveling underlayment resurfacer. Single component, self-leveling, cementitious material designed for easy application as an underlayment for all types of flooring materials. It is used for substrate repair and leveling.
- B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up. Gypsum-based products are unacceptable.
- C. System Characteristics:
 - 1. Wearing Surface: smooth
 - 2. Thickness: Per architectural drawings, ranging from feathered edge to 1", per application. Applications greater than 1" require additional 3/8" aggregate to mix or as recommended by manufacturer.
- D. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
- E. Compressive Strength: Minimum 4100 psi in 28 days in accordance with ASTM C109/C109M.
- F. Flexural Strength: Minimum 1000 psi in 28 days in accordance with ASTM C348
- G. Dry Time: Underlayment shall receive the application of moisture insensitive tile in 6 hours, floor coverings in 16 hours.
- H. Primer: compatible and as recommended by manufacturer for use over intended substrate
- I. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 - 1. Primer:
 - a. Resin: copolymer
 - b. Formulation Description: single component ready to use.
 - c. Application Method: Squeegee and medium nap roller.
 - 1) All puddles shall be removed, and material shall be allowed to dry, 1-2 hours at 70F/21C.
 - d. Number of Coats: (1) one.
 - 2. Grout Resurfacing Base:
 - a. Formulation Description: Single component, cementitious self-leveling high-early and high-ultimate strength grout.
 - b. Application Method: colloidal mix pump, cam rake, spike roll.
 - 1) Thickness of Coats: Per architectural scope, 1" lifts.
 - 2) Number of Coats: More than one if needed.
 - c. Aggregates: for applications greater than 1inch, require additional 3/8" aggregate to mix.

Property	Test	Value
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Subsurface Preparation for Floor Finishes

Compressive Strength	ASTM C109/C109M	2,200 psi @ 24 hrs 3,000 psi @ 7 days
Initial set time Final Set time	ASTM C191	30-45 min. 1 to 1.5 hours
Bond Strength	ASTM D7234	100% bond to concrete failure

2.3 CEMENTITIOUS TROWEL-APPLIED UNDERLAYMENT(NOT SUITABLE FOR RESINOUS FLOOR FINISHES)

- A. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
- B. Compressive Strength: Minimum 4000 psi in 28 days
- C. Trowel-applied underlayment shall not contain silica quartz (sand).
- D. Dry Time: Underlayment shall receive the application of floor covering in 15-20 minutes.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before testing and not less than three days after testing.
- B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation.
- C. Do not install materials when the temperatures of the substrate or materials are not within 60-85 degrees F/ 16-30 degrees C.

3.2 SURFACE PREPARATION

- A. Existing concrete slabs with existing floor coverings:
 1. Conduct visual observation of existing floor covering for adhesion, water damage, alkaline deposits, and other defects.
 2. Remove existing floor covering and adhesives. Comply with local, state and federal regulations and the RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to the floor covering being removed.
- B. Concrete shall meet the requirements of ASTM F710 and be sound, solid, clean, and free of all oil, grease, dirt, curing compounds, and any substance that might act as a bond-breaker before application. As required prepare slab by mechanical methods. No chemicals or solvents shall be used.
- C. General: Prepare and clean substrates according to flooring manufacturer's written instructions for substrate indicated.
- D. Prepare concrete substrates per ASTM D4259 as follows:
 1. Dry abrasive blasting.
 2. Wet abrasive blasting.
 3. Vacuum-assisted abrasive blasting.
 4. Centrifugal-shot abrasive blasting.
 5. Comply with manufacturer's written instructions.
- E. Repair damaged and deteriorated concrete according to flooring manufacturer's written recommendations.

- F. Verify that concrete substrates are dry.
- G. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of per flooring manufactures formal and project specific written recommendation.
- H. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity per flooring manufacture's formal and project specific written recommendation.
- I. Provide a written report showing test placement and results.
- J. Prepare joints in accordance with Section 07 92 00, JOINT SEALANTS and material manufacturer's instructions.
- K. Alkalinity: Measure surface pH in accordance with procedures provided in ASTM F710 or as outlined by qualified testing agency or flooring manufacturer's technical representative.
- L. Tolerances: Subsurface shall meet the flatness and levelness tolerance specified on drawings or recommended by the floor finish manufacturer. Tolerance shall also not to exceed 1/4" deviation in 10'. As required, install underlayment to achieve required tolerance.
- M. Other Subsurface: For all other subsurface conditions, such as wood or metal, contact the floor finish or underlayment manufacturer, as appropriate, for proper preparation practices.

3.3 MOISTURE REMEDIATION COATING:

- A. Where results of relative humidity testing (ASTM F2170) exceed the requirements of the specified flooring manufacturer, apply remedial coating as specified to correct excessive moisture condition.
- B. Prior to remedial floor coating installation mechanically prepare the concrete surface to provide a concrete surface profile in accordance with ASTM D4259.
- C. Mix and apply moisture remediation coating in accordance with manufacturer's instructions.

3.4 CEMENTITIOUS UNDERLAYMENT:

- A. Install cementitious self-leveling underlayment as required to floor flatness or levelness corrections to meet the tolerance requirements as or detailed on drawings, provide a smooth surface for the installation of floor covering, or meet elevation requirements detailed on drawings.
- B. Mix and apply in accordance with manufacturer's instructions.

3.5 PROTECTION

- A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, tempered hardwood, or other suitable protection course

3.6 FIELD QUALITY CONTROL

- A. Where specified, field sampling of products shall be conducted by a qualified, independent testing facility.

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SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies steel studs wall systems, shaft wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board, plaster bases or other building boards.

1.2 RELATED WORK

- A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
- B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- C. Pull down tabs in steel decking: Section 05 36 00, COMPOSITE METAL DECKING.
- D. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS; Section 09 29 00, GYPSUM BOARD.

1.3 TERMINOLOGY

- A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.
- C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Studs, runners and accessories.
 - 2. Hanger inserts.
 - 3. Channels (Rolled steel).
 - 4. Furring channels.
 - 5. Screws, clips and other fasteners.
- C. Shop Drawings:
 - 1. Typical ceiling suspension system.
 - 2. Typical metal stud and furring construction system including details around openings and corner details.
 - 3. Typical shaft wall assembly
 - 4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.
- D. Test Results: Fire rating test designation, each fire rating required for each assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

- A. In accordance with the requirements of ASTM C754.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society For Testing And Materials (ASTM)
- A641-09..... Zinc-Coated (Galvanized) Carbon Steel Wire
 - A653/653M-11 Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 - C11-10..... Terminology Relating to Gypsum and Related Building Materials and Systems
 - C635-07..... Manufacture, Performance, and Testing of Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings
 - C636-08..... Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
 - C645-09..... Non-Structural Steel Framing Members
 - C754-11..... Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
 - C841-03(R2008) Installation of Interior Lathing and Furring
 - C954-10..... Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
 - E580-11 Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

PART 2 - PRODUCTS

2.1 PROTECTIVE COATING

- A. Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G40 or equivalent.

2.2 STEEL STUDS AND RUNNERS (TRACK)

- A. ASTM C645, modified for thickness specified and sizes as shown.
1. Use C 645 steel, 0.75 mm (0.0296-inch) minimum base-metal (30 mil).
 2. Runners same thickness as studs.
 3. Exception: Members that can show certified third party testing with gypsum board in accordance with ICC ES AC86 (Approved May 2012) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645. The submission of an evaluation report is acceptable to show conformance to this requirement. Use C 645 steel, 0.48mm (0.019 inch) minimum base-metal (19 mil).
 - a. Increase member thickness to minimum 30 MIL (20 GA) 0.762 MM studs at following conditions, if contractor selects 2.2 A. 3. Exception above and uses 19 MIL studs:
 - 1) One or both sides of walls faced with any of following:
 - a) Wall mounted cabinetry and equipment.
 - b) Tile Backing Board.
 - c) Moisture-resistant.
 - d) Lead backed gypsum wallboard.

Non-Structural Metal Framing

- b. Where walls do not extend to overhead structural deck, and without supporting diagonal bracing, or horizontal stiffeners.
- 4. Increase member thickness to minimum 54 MIL (16 GA) 1.37 MM studs at following conditions:
 - a. One or both sides of walls faced with any of following:
 - 1) Adhered stone.
- 5. Where walls do not extend to overhead structural deck, and without supporting diagonal bracing, or horizontal stiffeners.
- B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.
- C. Doubled studs for openings and studs for supporting concrete backer-board.
- D. Studs 3600 mm (12 feet) or less in length shall be in one piece.
- E. Shaft Wall Framing:
 - 1. Conform to rated wall construction.
 - 2. C-H Studs or C-T Studs.
 - 3. E Studs.
 - 4. J Runners.
 - 5. Steel Jamb-Strut.

2.3 FURRING CHANNELS

- A. Rigid furring channels (hat shape): ASTM C645.
- B. Resilient furring channels:
 - 1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
 - 2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.
- C. "Z" Furring Channels:
 - 1. Not less than 0.45 mm (0.0179-inch)-thick base metal, with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.
 - 2. Web furring depth to suit thickness of insulation.
- D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

- A. ASTM C754, except as otherwise specified.
- B. For fire rated construction: Type and size same as used in fire rating test.
- C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.
- D. Clips: ASTM C841 (paragraph 6.11), manufacturer's standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.
- E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.
- F. Tie Wire and Hanger Wire:
 - 1. ASTM A641, soft temper, Class 1 coating.
 - 2. Gage (diameter) as specified in ASTM C754 or ASTM C841.
- G. Attachments for Wall Furring:
 - 1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.

2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.
- H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened, but no less than:
 1. Power driven type, to withstand minimum 190 LBS 86 kg shear when driven.
- I. Knee Wall Brace:
 1. Steel tube and baseplate bolted to concrete floor slab with tube projecting vertically; concealed within framed walls to provide structural stability for knee walls.
 2. Design components compatible with wall type.
 3. Material: Cold-rolled steel tube and base plate, fully welded.
 4. Overall height: Wall height less 2 IN 50 MM.
 5. Spacing as recommended by manufacturer.
- J. Shower Seat Support:
 1. Conceal in framed walls.
 2. Vertical steel channels with welded steel plate.
 3. Anchor channels to floor and structure above with steel angles.
 4. Provide stainless steel sleeves at each bolt that attach shower seat to support bracket in wall
 - a. Extend past finish face of wall tile 1/8 IN 3 MM.
 5. Components:
 - a. C3 x 6 cold formed steel channel.
 - 1) Brace with horizontal channel at 96 IN 2.4 M AFF.
 - b. Steel plate: 24 x 20 x 3/8 IN 610 x 510 x 10 MM.
 - 1) Weld to steel channels with top of plate at 20 IN 500 MM AFF.
 - c. Steel angles: 3 x 3 x 1/4 x 3 IN 75 x 75 x 6 x 75 MM.
 - d. Stainless steel sleeves: 3/8 IN 10 MM diameter.
 - e. Expansion bolts with 3-1/2 IN 90 MM embedment.
- K. Closure:
 1. Continuous 30 MIL (20 GA) 0.75 MM galvanized closure angle to receive vapor retarder and vapor retarder tape.
- L. Metal Blocking (TYPE B):
 1. C-shaped modified track runners.
 2. G40 galvanized.
 3. Backing height: 6 IN 150 MM minimum or deeper.
 4. Flange width: 1-1/4 IN 32 MM minimum.
 5. Thickness: 30 MIL (20 GA) 0.75 MM minimum.
- M. Metal Blocking (TYPE C):
 1. C-shaped modified track runners.
 2. G40 galvanized.
 3. Backing height: 8 IN 203 MM minimum or deeper.
 4. Flange width: 1-1/4 IN 32 MM minimum.
 5. Thickness: 68 MIL (14 GA) 1.72 MM minimum.
- N. Backing - Flat Plate (TYPE A):
 1. Flat, sheet metal stock per ASTM A1008.
 2. G40 galvanized.
 3. Thickness: 43 MIL (18 GA) 1.27 MM minimum.
- O. General installations:
 1. Dimensions: 2 to 12 IN 50 to 300 MM wide, as necessary for items to be supported.
 2. Thickness: 30 MIL (20 GA) 0.75 MM minimum.
 3. Use heavier gauge as necessary for items to be supported.

Non-Structural Metal Framing

2.5 SUSPENDED CEILING SYSTEM FOR GYPSUM BOARD (OPTION)

- A. Conform to ASTM C635, heavy duty, with not less than 35 mm (1-3/8 inch) wide knurled capped flange face designed for screw attachment of gypsum board.
- B. Wall track channel with 35 mm (1-3/8 inch) wide flange.

PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

- A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be same as that used in fire rating test.
- B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2) of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

3.2 INSTALLING STUDS

- A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.
 - 1. Gypsum Board Assemblies: Comply with additional requirements in ASTM C840 relative to framing installation.
- B. Space studs not more than 610 mm (24 inches) on center.
- C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.
- D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.
- E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions.
 - 1. Exception: Where partitions are indicated to terminate at, or just above, suspended ceilings.
 - 2. Continue framing around ducts and similar items which penetrate partitions.
- F. Openings:
 - 1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
 - 2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.
 - 3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.
 - 4. Control Joints (CJ):
 - a. Install additional stud, maximum 1/2 IN 13 MM from jamb studs.
 - b. Do not fasten extra stud to track or jamb stud.
 - c. Refer to specification Section 09 29 00 for control joint locations.
 - 5. Prefabricated headers, jambs, and sill framing systems option:
 - a. Proprietary opening framing systems may be used as an alternative to conventionally fabricated framing.
 - 6. Door Openings:
 - a. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section for cripple studs at head and secure to jamb studs.
 - b. Unless indicated otherwise, extend jamb studs through suspended ceilings and secure laterally to overhead structure.
 - c. Jamb Studs:
 - 1) Install two studs at each jamb, unless otherwise indicated.

- 2) Minimum thickness of jamb studs: 30 MIL (20 GA) 0.762 MM at openings.
 - 3) Securely attach jamb studs to door frames.
 - 4) Attach drywall to both studs equally.
7. Headers:
 - a. Openings less than 4 FT 1.2 M wide:
 - 1) Cut-to-length section of floor runner above and below wall openings.
 - 2) Split flanges and bend webs at ends.
 - 3) Overlap and screw attach jamb studs to frames.
 - b. Openings over 4 FT 1.2 M wide:
 - 1) Cut-to-length, horizontal box beam studs above and below wall openings.
 - 2) Design for actual span and loading.
 - c. Incorporate miscellaneous steel members, specified in Section 05 50 00, and wood blocking, specified in Section 06 10 00, where indicated.
8. Control Joints at head of jambs:
 - a. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2 IN 13 MM clearance from jamb stud to allow for installation of control joint in finished assembly.
9. Other Framed Openings:
 - a. Frame openings other than door openings the same as required for door openings, unless otherwise indicated.
 - b. Install framing below sills of openings to match framing required above door heads.
 - c. Cripple Studs:
 - 1) Install cut-to-length intermediate vertical studs above and below openings.
 - 2) Spacing: As indicated for typical full-length studs.
 - d. Incorporate miscellaneous steel members, specified in Section 05 50 00, and wood blocking, specified in Section 06 10 00, where indicated.
- G. Fastening Studs:
 1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
 2. Anchor studs to deflection track with wafer head screws on both flanges of each stud.
 - a. Maintain deflection gap between top of stud and top of slotted track.
 - b. Install screws at centerline of slot and secure allowing vertical movement.
 3. Anchor fire rated partitions as required by fire resistance design, and firestopping design.
- H. Chase Wall Partitions:
 1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
 2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).
- I. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.
- J. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- K. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.
- L. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- M. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- N. Position studs vertically engaging floor track and head of wall deflection track.
 1. Align stud knockouts to facilitate running of wires and conduit.

- O. Provide additional studs at corners, partition intersections and terminations of partitions, and at each side of control joints.
- P. Where partitions abut vertical structural elements, provide perimeter relief per Gypsum Association GA-600 Strain Relief System details.
- Q. Head-of-Wall:
1. Provide slotted top track for walls extended to structure.
 2. Configure to resist lateral loads while accommodating deflection of overhead building superstructure without inducing axial loading on partition framing.
 3. Secure deflection track to structure in accordance with industry standards and regulatory requirements.
 4. Secure at corners and at ends.
 5. Cut vertical studs 5/8 IN 16 MM short to create a deflection gap when installed into top track.
 - a. Secure vertical studs to top track with framing screw at each stud flange, screwing through track slots for positive stud connection.
 6. Secure Gypsum Wallboard to vertical studs; do not secure Gypsum Wallboard to top track directly.
 7. Where partitions attach to structural elements that are scheduled to receive Spray-applied Fire Resistive Materials (SFRM):
 - a. Install Z-bar to underside of steel beams and steel deck before application of sprayed fireproofing.
 - b. Locate Z-bars perpendicular to line of partition, spaced maximum 16 IN on center.
 - c. Attach each Z-bar with two 0.145 IN x 1 IN 3.7 MM x 25 MM powder-actuated fasteners located minimum 1 IN from ends of Z-bar.
 - d. After fireproofing, secure top track to Z-bars with No. 8 x 5/8 IN wafer head framing screws spaced maximum 16 IN 400 MM on center.
 8. Where fire-rated partitions are offset and will not clear fireproofed steel beam, extend Z-bar outrigger horizontally from bottom of beam out to minimum 2 IN 50 MM beyond width of head-of-wall.
 - a. Attach 3/4 IN 19 MM expanded metal lath continuous, width of top of Z-bar outriggers prior to fireproofing steel beam to accommodate sprayed fireproofing.
 9. Prepare wall for installation of seals, firestopping, or both:
 - a. Fire-rated Walls: Prepare for fire-resistive joint assemblies specified in Section 07 84 00.
 10. Non-fire rated partitions including smoke partitions: prepare for acoustical sealant specified in section 07 92 00. installing wall furring for finish applied to one side only
- R. Wall furring-Stud System:
1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
 2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
 3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.
- S. Direct attachment to masonry or concrete; rigid channels or "Z" channels:
1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.
 2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.
 3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
 4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
 5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.

6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.
7. Where furring channels are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

3.3 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

- A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.
- B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.
- C. Coordinate mounting height, location, and coverage with item to be supported.
- D. Determine material width according to item to be supported.
- E. Provide in-wall metal wall backing material to interior metal stud walls specified herein and Exterior stud walls specified in Section 05 40 00.
- F. Attachment: Minimum 2 - #10 sheet metal screws at each stud.

3.4 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

- A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.
- B. Wall furring-Stud System:
 1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
 2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
 3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.
- C. Direct attachment to masonry or concrete; rigid channels or "Z" channels:
 1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.
 2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.
 3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
 4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
 5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.
 6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.
 7. Where furring channels are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

3.5 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

- A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.
- B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

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- C. Coordinate mounting height, location, and coverage with item to be supported.
- D. Determine material width according to item to be supported.
- E. Provide in-wall metal wall backing material to interior metal stud walls specified herein and Exterior stud walls specified in Section 05 40 00.
- F. Attachment: Minimum 2 - #10 sheet metal screws at each stud.

3.6 INSTALLING SHAFT WALL SYSTEM

- A. Conform to UL Design No. V473 for two-hour fire rating and one-hour fire rating.
- B. Position J runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural supports with power driven fasteners at both ends and 600 mm (24 inches) on center.
- C. After liner panels have been erected, cut C-H studs and E studs, from 9 mm (3/8-inch) to not more than 13 mm (1/2-inch) less than floor-to-ceiling height. Install C-H studs between liner panels with liner panels inserted in the groove.
- D. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.
- E. Suitably frame all openings to maintain structural support for wall:
 - 1. Provide necessary liner fillers and shims to conform to label frame requirements.
 - 2. Frame openings cut within a liner panel with E studs around perimeter.
 - 3. Frame openings with vertical E studs at jambs, horizontal J runner at head and sill.

3.7 INSTALLING FURRED AND SUSPENDED CEILINGS OR SOFFITS

- A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.
 - 1. Space framing at 600 mm (24-inch) centers for gypsum board anchorage.
- B. Concrete slabs on steel decking composite construction:
 - 1. Use pull down tabs when available.
 - 2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.
- C. Where bar joists or beams are more than 1200 mm (48 inches) apart, provide intermediate hangers so that spacing between supports does not exceed 1200 mm (48 inches). Use clips, bolts, or wire ties for direct attachment to steel framing.
- D. Steel decking without concrete topping:
 - 1. Do not attach hangers to steel roof deck.
 - 2. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 3. Do not connect or suspend steel framing from ducts, pipes, or conduit.
 - a. Where width of ducts and other construction within ceiling plenum interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - 1) Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
- E. Installing suspended ceiling system for gypsum board (ASTM C635 Option):
 - 1. Install only for ceilings to receive screw attached gypsum board.
 - 2. Install in accordance with ASTM C636.
 - a. Install main runners spaced 1200 mm (48 inches) on center.

- b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
 - c. Install wall track channel at perimeter.
- F. Installing Ceiling Bracing System:
 - 1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm (8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap channels not less than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.
 - 2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.

3.8 TOLERANCES

- A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
- B. Plumb and align vertical members within 3 mm (1/8-inch.)
- C. Level or align ceilings within 3 mm (1/8-inch.)

- - - E N D - -

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies installation and finishing of gypsum board.

1.2 RELATED WORK

- A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- B. Sheet Waterproofing System for Shower and other Wet Walls: Section 07 13 00, Sheet Waterproofing.
- C. Section 07 21 13, THERMAL INSULATION.
- D. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.
- E. Lay in gypsum board ceiling panels: Section 09 51 00, ACOUSTICAL CEILING.

1.3 TERMINOLOGY

- A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.
- C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Cornerbead and edge trim.
 - 2. Finishing materials.
 - 3. Laminating adhesive.
 - 4. Gypsum board, each type.
- C. Shop Drawings:
 - 1. Typical gypsum board installation, showing corner details, edge trim details and the like.
 - 2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
 - 3. Typical shaft wall assembly.
 - 4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.
- D. Samples:
 - 1. Cornerbead.
 - 2. Edge trim.
 - 3. Control joints.
- E. Test Results:

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1. Fire rating test, each fire rating required for each assembly.
2. Sound rating test.

F. Certificates: Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos material.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

A. In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

A. In accordance with the requirements of ASTM C840.

1.7 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American Society for Testing And Materials (ASTM):

- C11-15..... Terminology Relating to Gypsum and Related Building Materials and Systems
- C475-15..... Joint Compound and Joint Tape for Finishing Gypsum Board
- C840-13..... Application and Finishing of Gypsum Board
- C919-12..... Sealants in Acoustical Applications
- C954-15..... Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Stud from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness
- C1002-14..... Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
- C1047-14..... Accessories for Gypsum Wallboard and Gypsum Veneer Base
- C1177-13..... Glass Mat Gypsum Substrate for Use as Sheathing
- C1178/C1178M-18..... Specification for Coated Glass Mat Water Resistant Backing Panel
- C1658-13..... Glass Mat Gypsum Panels
- C1396-14..... Gypsum Board
- C1629..... Abuse-Resistant Non-decorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
- D3273..... Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- E84 Surface-Burning Characteristics of Building Materials.
- E90 Sound Transmission Testing.
- E119 Fire Tests of Building Construction.
- E413 Classification for Rating Sound Insulation

C. Underwriters Laboratories Inc. (UL):
Latest Edition..... Fire Resistance Directory

D. Inchcape Testing Services (ITS):

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Latest Editions..... Certification Listings

- E. Gypsum Association (GA):
 - 1. GA-216 Application and Finishing of Gypsum Panel Products.
 - 2. GA-234 Control Joints for Fire-Resistance Rated Systems.
 - 3. GA-238 Guidelines for Prevention of Mold Growth on Gypsum Board.
- F. Fire Resistant Rated Assemblies:
 - 1. For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
 - 2. Provide materials listed by UL, or other approved testing laboratory, for construction and rating type indicated.
- G. STC Rated Assemblies:
 - 1. Provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
 - 2. Facility Guidelines Institute (FGI):
 - a. FGI Guidelines for Design and Construction of Healthcare Facilities:
 - 1) Sound and Vibration Requirements.
 - 3. American National Standards Institute (ANSI):
 - a. S1.1 American National Standard Acoustical Terminology.
 - b. S1.4 American National Standard Specification for Sound Level Meters.
 - c. S1.4 American National Standard Specification for Sound Level Meters.
 - d. S1.43 American National Standard Specifications for Integrating-Averaging Sound Level Meters.
 - 4. ASTM International (ASTM):
 - a. C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - b. C634 Standard Terminology Relating to Building and Environmental Acoustics.
 - c. C840 Standard Specification for Application and Finishing of Gypsum Board.
 - d. E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - e. E336 Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings.
 - f. E413 Classification for Rating Sound Insulation.
 - g. E966 Standard Guide for Field Measurements of Airborne Sound Insulation of Building Facades and Façade Elements.
 - 5. American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - a. ASHRAE Handbook: Sound and Vibration Control.
 - 6. South Coast Air Management District (SCAQMD):
 - a. SCAQMD Rule 1113 Architectural Coatings.
 - b. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish in maximum available lengths, consistent with installation requirements.
 - 1. Long Edge: Tapered.
 - 2. Short Ends: Square.
- B. Upgrade listed types to fire rated equivalent products when used in fire rated assemblies.


Gypsum Board

- C. Provide listed GWB products to mold and moisture resistant types, where wallboard is installed in Electrical, Communication Rooms, Mechanical shafts, Stair Shafts and similar locations where wallboard is installed prior to building being weathertight.
- D. Framing and suspension systems for Gypsum Board Ceilings: Specified in Section 09 22 16.
- E. Firestopping: Specified in Section 07 84 00.
- F. Thermal and Acoustic Insulation: Specified in Section 07 21 13.
- G. Interior Expansion Joint Covers: Specified in Section 07 95 13.
- H. Paper facings shall contain 100 percent post-consumer recycled paper content.

2.2 GYPSUM BOARD

- A. Gypsum Board:
 - 1. ASTM C1396.
 - 2. Thickness: 16 mm (5/8 inch) thick unless shown otherwise.
 - 3. Type X core
- B. Shaftwall Liner Panel, Fire rated:
 - 1. Panel size: 1 IN x 24 IN 25 MM x 610 MM wide.
 - 2. Type X core.
 - 3. Mold and moisture resistant:
 - 4. Mold resistance score: 10 per ASTM D3273.
 - 5. Fiberglass coated glass mats, both faces per ASTM C1658.



- C.  Acoustically Enhanced Gypsum Wallboard (AEGWB):
 - 1. Two-ply high density, mold resistant, paper faced gypsum wallboard laminated together with viscoelastic dampening polymer.
 - 2. Composite Thickness: 5/8 IN 15 MM.
 - 3. Fire resistant, Type X gypsum core.
 - a. ASTM C1396.
 - b. Products which do not include a Type X core may be used in partitions that do not have a fire resistance requirement.
- D. Interior face of exterior walls and rooms where moisture or high humidity is present:
 - 1. Mold and moisture resistant gypsum panels (MRGWB).
 - 2. Gypsum panels, with glass mat facer per ASTM C1658.
 - 3. Thickness: 5/8 IN 15 MM.
 - 4. Mold resistance score: 10 per ASTM D3273.
 - 5. Apply continuously to interior face of exterior stud walls prior to framing interior partitions and ceilings.
 - 6. Where MR wallboard is scheduled in fire rated walls, provide approved fire resistive products with comparable moisture resistance.
- E. Tile Backer Board (TBB):
 - 1. Moisture resistant treated gypsum core, glass mats on both sides, and acrylic water barrier or water resistant gypsum coating on finished side.

2. Provide TBB at walls of showers, tub rooms, toilet rooms, decontamination rooms, and similar walls where tile is scheduled.
 3. Thickness: 1/2 IN 12.5 MM.
 4. Thickness: 5/8 IN 15 MM type X at rated walls.
 5. Mold resistance score: 10 per ASTM D3273.
 6. Include Level 5 finish at non-tiled portions.
- F. Impact Resistant Gypsum Wallboard (IRGWB):
1. Thickness: 5/8 IN 15 MM.
 2. Type X core.
 3. Mold resistance score: 10 per ASTM D3273.
 4. Tested in accordance with ASTM C1629.
 5. Soft Body Impact: Level 2, minimum.
 6. Hard Body Impact: Level 2, minimum.
 7. Upgrade metal studs to 54 MILS (16 GA) minimum where used with IRGWB.
 8. Base product, glass mat facer – ASTM C1658

2.3 GYPSUM SHEATHING BOARD

- A. ASTM C1396, Type X, water-resistant core, 16 mm (5/8 inch) thick.
- B. ASTM C1177, Type X.

2.4 ACCESSORIES

- A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.
- B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.
- C. Trim:
 1. Interior Trim:
 - a. Material: Galvanized or aluminum coated steel sheet, rolled zinc, paper faced galvanized steel sheet, or paper faced structural laminate.
 - b. Material for wet areas: Zinc.
 - c. Shapes:
 - 1) Corner bead.
 - 2) LC-Bead: J-shaped; exposed long flange receives joint compound.
 - 3) L-Bead: L-shaped; exposed long flange receives joint compound.
 - 4) U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - 5) Control joint.
 - 6) Curved Edge Corner bead: With notched or flexible flanges.
 - 7) Other items as indicated.
- D. Joint Treatment Materials:
 1. Use product types recommended by wallboard manufacturer for each condition.
 2. Materials compatible with other compounds applied previously or on successive coats.
 3. Provide dust control products in occupied areas or adjacent to occupied areas.
 4. Joint tape:
 - a. Interior gypsum wallboard: Paper.
 - b. Tile backing panels: As recommended by panel manufacturer.
 5. Joint compounds for interior gypsum wallboard:
 - a. Setting type joint compound:
 - 1) Filling open joints and voids.
 - 2) Embedding tape and first coat over joints, fasteners and trim flanges.
 6. Lightweight setting type joint compound:
 - a. Second coat.
 - b. Final, skim coat on surfaces receiving a Level 5 finish.

Gypsum Board

7. Drying type all-purpose joint compound:
 - a. Second and third coats.
 - b. Final, skim coat, on surfaces receiving a Level 5 finish.
 - c. Spray applied coating compound:
 - d. Final, skim coat, on surfaces receiving a Level 5 finish.
 8. Joint compounds for moisture resistant gypsum wallboard:
 - a. Setting type joint compound:
 - 1) Filling open joints and voids.
 - 2) Embedding tape and first coat over joints, fasteners and trim flanges.
 - b. Lightweight setting type joint compound:
 - 1) Second and third coats.
 - 2) Final, skim coat on surfaces receiving a Level 5 finish.
- E. Acoustical Materials:
1. Provide where indicated.
 2. Include for use at electrical outlets, switches and service devices.
 3. Preformed acoustical seal for wall boxes:
 - a. Box Seal by STC Sound Control
 - b. Molded neoprene, durometer A-40 complying with ASTM D2000.
 - c. Formed to fit the electrical device, outlet and service boxes.
 - d. STC improvement: 6 db in accordance to ASTM E90.
 4. Provide at electrical and service box penetrations in sound rated walls.
- F. Polyethylene Sheet:
1. Polyethylene sheet conforming to ASTM D4397.
 2. Nominal thickness: 0.15 mm (6 mils).

2.5 FASTENERS

- A. ASTM C1002 and ASTM C840, except as otherwise specified.
- B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).
- C. Select screws of size and type recommended by the manufacturer of the material being fastened.
- D. For fire rated construction, type and size same as used in fire rating test.
- E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

2.6 FINISHING MATERIALS AND LAMINATING ADHESIVE

- A. ASTM C475 and ASTM C840. Free of antifreeze, vinyl adhesives, preservatives, biocides and other VOC. Adhesive shall contain a maximum VOC content of 50 g/l.
- B. Manufacturer's recommended type for use with selected materials, mildew resistant, non-staining type, and with a VOC content of 50 g/L or less.
- C. Adhesives shall contain no carcinogen or reproductive toxicant components present at more than 1 PCT of total mass of the product as defined in the California Office of Environmental Health Hazard Assessment's (OEHHA) list entitled Chemicals Known to the State to Cause Cancer or the Reproductive Toxicity, Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65).
- D. Backing for Control Joints:
 1. Fire rated board.
- E. Backing for control joints:
 1. Firestopping.
- F. Support straps:

1. Galvanized steel sheet for retaining and bracing in length and width indicated or as required for adequate support of assembly.
 2. Minimum Base-Metal Thickness: 30 MILS (20 gauge).
- G. Sealer for Moisture Resistant Gypsum Wallboard:
1. Manufacturer's standard compound.
 2. Use at joints, cut edges and screw penetrations.

PART 3 - EXECUTION

3.1 GYPSUM BOARD HEIGHTS

- A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:
- a. All Walls, unless noted otherwise.
 - b. Corridor partitions.
2. One side of partitions or furring:
- a. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.
3. Extend all layers of gypsum board construction used for fireproofing of columns from floor to underside of structure overhead, unless shown otherwise.
- B. In locations other than those specified, extend gypsum board from floor to heights as follows:
1. Not less than 100 mm (4 inches) above suspended acoustical ceilings.
 2. At ceiling of suspended gypsum board ceilings.
 3. At existing ceilings.

3.2 INSTALLING GYPSUM BOARD

- A. Coordinate installation of gypsum board with other trades and related work.
- B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.
- C. Moisture and Mold-Resistant Assemblies: Provide and install moisture and mold-resistant glass mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 where shown, specified herein, and in locations which might be subject to moisture exposure during construction.
1. Products proposed are subject to COR approval.
 2. Exposure time shall be limited by manufacturer requirements.
- D. Use gypsum boards in maximum practical lengths to minimize number of end joints.
- E. Bring gypsum board into contact, but do not force into place.
- F. Ceilings:
1. For single-ply construction, use perpendicular application.
 2. For two-ply assemblies:
 - a. Use perpendicular application.
 - b. Apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.
- G. Walls (Except Shaft Walls):
1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
 2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
 3. Stagger screws on abutting edges or ends.
 4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.

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5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.
6. For three-ply gypsum board assemblies, apply plies in same manner as for two-ply assemblies, except that heads of fasteners need only be driven flush with surface for first and second plies. Apply third ply of wallboard in same manner as second ply of two-ply assembly, except use fasteners of sufficient length enough to have the same penetration into framing members as required for two-ply assemblies.
7. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
8. Installing Two Layer Assembly Over Sound Deadening Board:
 - a. Apply face layer of wallboard vertically with joints staggered from joints in sound deadening board over framing members.
 - b. Fasten face layer with screw, of sufficient length to secure to framing, spaced 300 mm (12 inches) on center around perimeter, and 400 mm (16 inches) on center in the field.
9. Control Joints ASTM C840 and as follows:
 - a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
 - b. Not required for wall lengths less than 9000 mm (30 feet).
 - c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.
- H. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:
 1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
 2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
 3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.
- I. Electrical and Telecommunications Boxes:
 1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.
 2. Preformed Acoustical Seal for Wall Boxes:
 - a. Place preformed seal over exposed outlet box flush with wall surface with device protruding through preformed or precut opening in seal.
 - b. Secure in place with outlet cover plate.
- J. Accessories:
 1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
 2. Install in one piece, without the limits of the longest commercially available lengths.
 3. Corner Beads:
 - a. Install at all vertical and horizontal external corners and where shown.
 - b. Use screws only. Do not use crimping tool.
 4. Edge Trim (casings Beads):
 - a. At both sides of expansion and control joints unless shown otherwise.
 - b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
 - c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
 - d. Where shown.

3.3 INSTALLING GYPSUM SHEATHING

- A. Install in accordance with ASTM C840, except as otherwise specified or shown.
- B. Use screws of sufficient length to secure sheathing to framing.
- C. Space screws 9 mm (3/8 inch) from ends and edges of sheathing and 200 mm (8 inches) on center. Space screws a maximum of 200 mm (8 inches) on center on intermediate framing members.
- D. Apply 600 mm by 2400 mm (2 foot by 8 foot) sheathing boards horizontally with tongue edge up.
- E. Apply 1200 mm by 2400 mm or 2700 mm (4 ft. by 8 ft. or 9 foot) gypsum sheathing boards vertically with edges over framing.

3.4 CAVITY SHAFT WALL

- A. Coordinate assembly with Section 09 22 16, NON-STRUCTURAL METAL FRAMING, for erection of framing and gypsum board.
- B. Conform to UL Design No. V473 , or FM WALL CONSTRUCTION 25-1/HR (Non-loadbearing) for one-hour fire rating where shown.
- C. Cut coreboard (liner) panels 25 mm (one inch) less than floor-to-ceiling height, and erect vertically between J-runners on shaft side.
 - 1. Where shaft walls exceed 4300 mm (14 feet) in height, position panel end joints within upper and lower third points of wall.
 - 2. Stagger joints top and bottom in adjacent panels.
 - 3. After erection of J-struts of opening frames, fasten panels to J-struts with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
- D. Gypsum Board:
 - 1. Two hour wall:
 - a. Erect base layer (backing board) vertically on finish side of wall with end joints staggered. Fasten base layer panels to studs with 25 mm (one inch) long screws, spaced 600 mm (24 inches) on center.
 - b. Use laminating adhesive between plies in accordance with UL or FM if required by fire test.
 - c. Apply face layer of gypsum board required by fire test vertically over base layer with joints staggered and attach with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
 - 2. One hour wall with one layer on finish side of wall: Apply face layer of gypsum board vertically. Attach to studs with screws of sufficient length to secure to framing, spaced 300 mm (12 inches) on center in field and along edges.
 - 3. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.
- E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.
- F. Elevator Shafts:
 - 1. Protrusions including fasteners other than flange of shaft wall framing system or offsets from vertical alignments more than 3 mm (1/8-inch) are not permitted unless shown.
 - 2. Align shaft walls for plumb vertical flush alignment from top to bottom of shaft.

3.5 FINISHING OF GYPSUM BOARD

- A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for all finished areas open to public view.
 - 1. After drying, sand or otherwise smooth final coat of compound as needed to eliminate high spots or excess compound to leave smooth, even, and level surface.

Gypsum Board

2. Draw down final coat of compound to a smooth even plane.
3. Locations:
 - a. Wallboard scheduled to be finished with Gloss Level 1 (flat), Level 2 (velvet), or Level 3 (eggshell) paint, glazed coating, textured coating, or wall covering.
 - b. Wallboard scheduled to be finished with Level 1 (flat) paint, textured coating, or wallcovering.
 - c. Where above listed surfaces are to be finished with textured decorative treatments, wall covering, paneling, or wall guard.
 - d. Remaining locations, unless noted otherwise.
- B. Level 5 Finish:
 1. Trowel skim coat of joint compound leaving a thin film covering the entire surface, in accordance with manufacturer's recommendations.
 2. Make surfaces free of tool marks and ridges.
 3. Locations:
 - a. Exposed ceiling, soffit, or wall areas abutting window mullions, skylights, or receiving direct indoor lighting.
 - b. Hallways or corridors unbroken by doorways or windows in excess of twenty feet 6 m.
 - c. Atriums, Lobbies, Auditoriums and similar large spaces.
 - d. Multi-story spaces.
 - e. Wall board scheduled to be finished with Gloss Level 4 (satin), Level 5 (semi-gloss), Level 6 (gloss), Level 7 (high gloss), paint, glazed coating, textured coating, or wall covering.
 - f. Wall board scheduled to be finished with Level 2 (velvet), Level 3 (eggshell), Level 4 (satin), Level 5 (semi-gloss), Level 6 (gloss), Level 7 (high gloss), epoxy paint, or high build glazed coating.
 - g. Surfaces using Moisture Resistant Gypsum Wallboard, Tile Backer Board or other wallboard types with a glass mat facer on finished side.
- C. Glass Mat, Water Resistant Backing Panels (TBB):
 1. Finish according to manufacturer's written instructions.
 2. TCNA Systems W245-1.
 3. Coordinate install of Glass Mat, Water Resistant Backing Panels (TBB) with Section 09 30 13, CERAMIC PORCELAIN TILING.
 4. Walls:
 - a. In showers or other wet areas cover studs with polyethylene sheet.
 - b. In showers or other wet areas cover TBB with Sheet Waterproofing per Section 07 13 00.
- D. Before proceeding with installation of finishing materials, assure the following:
 1. Gypsum board is fastened and held close to framing or furring.
 2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.
- E. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of non-decorated smoke barrier, fire rated, and sound rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier, fire rated, and sound rated construction/ Sanding is not required of non-decorated surfaces.

3.6 REPAIRS

- A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.

- B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.
- D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non-decorated surface to provide smoke tight construction , fire protection equivalent to the fire rated construction , and STC equivalent to the sound rated construction.

3.7 CEILINGS

- A. At Mental Health and Behavioral Nursing Units, areas accessible to patients and not continuously observable by staff (e.g., patient bedrooms, day rooms), ceilings should be a solid material such as gypsum board. This will limit patient access. Access doors are needed to access electrical and mechanical equipment above the ceiling. These doors should be locked to prevent unauthorized access and secured to ceiling using tamper resistant fasteners.

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SECTION 09 30 13

CERAMIC/PORCELAIN TILING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies interior ceramic, porcelain, terrazzo divider strips, waterproofing membranes for thin-set applications, crack isolation membranes, and tile backer board.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Shower Waterproofing: Section 07 13 00 Sheet Waterproofing
- C. Preformed expansion joints in tile flooring: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
- D. Sealing of Joints: Section 07 92 00, JOINT SEALANTS.
- E. Color, Texture, Pattern, and Size of Field Tile and Trim Shapes, and Color of Grout Specified: See Construction documents..
- F. Metal and Resilient Edge Strips at Joints with New Resilient Flooring: Section 09 65 19, RESILIENT TILE FLOORING.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Samples:
 - 1. Base tile, each type, each color, each size.
 - 2. Mosaic floor tile panels, 228 by 228 mm (9 by 9 inches), each type, color, size and pattern.
 - 3. Porcelain tile, each type, color, patterns and size.
 - 4. Wall (or wainscot) tile, each color, size and pattern.
 - 5. Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, color, and size.
- D. Product Data:
 - 1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
 - 2. Chemical resistant mortar and grout (epoxy and furan).
 - 3. Dry-set portland cement mortar and grout.
 - 4. Divider strip.
 - 5. Reinforcing tape.
 - 6. Leveling compound.
 - 7. Latex-portland cement mortar and grout.
 - 8. Commercial portland cement grout.
 - 9. Organic adhesive.
 - 10. Slip resistant tile.
 - 11. Waterproofing isolation membrane.
 - 12. Fasteners.
- E. Certification:

1. Master grade certificate, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
 - a. Chemical resistant mortar and grout (epoxy and furan).
 - b. Modified epoxy emulsion.
 - c. Commercial portland cement grout.
 - d. Dry-set portland cement mortar and grout.
 - e. Reinforcing tape.
 - f. Latex-portland cement mortar and grout.
 - g. Leveling compound.
 - h. Organic adhesive.
 - i. Waterproof isolation membrane.
 - j. Factory back mounted tile documentation for suitability for application in wet area.

F. Installer Qualifications:

1. Submit letter stating installer's experience.

1.4 DELIVERY AND STORAGE:

- A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.
- B. Store material to prevent damage or contamination.

1.5 QUALITY ASSURANCE:

- A. Installers to be from a company specializing in performing installation of products specified and have a minimum of three (3) years' experience.
- B. Each type and color of tile to be provided from a single source.
- C. Each type and color of mortar, adhesive, and grout to be provided from the same source.

1.6 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

1.7 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.
- B. American National Standards Institute (ANSI):
 - A10.20-06(R2011)..... Safe Operating Practices for Tile, Terrazzo and Marble
WorkA108/A118/A136-14 Installation of Ceramic Tile
 - A108.01-13..... Subsurfaces and Preparations by Other Trades
 - A108.02-13..... Materials, Environmental, and Workmanship
 - A108.1A-14 Installation of Ceramic Tile in the Wet-Set Method with Portland
Cement Mortar
 - A108.1B-10 Installation of Ceramic Tile on a Cured Portland Cement Mortar
Setting Bed with Dry-Set or Latex-Portland Cement Mortar
 - A108.1C-10 Contractors Option; Installation of Ceramic Tile in the Wet-Set
method with Portland Cement Mortar or Installation of Ceramic
Tile on a Cured Portland Cement Mortar Setting Bed with Dry-
Set or Latex-Portland Cement Mortar
 - A108.4-09..... Ceramic Tile with Organic Adhesives or Water Cleanable Tile-
Setting Epoxy Adhesive
 - A108.6-10..... Ceramic Tile with Chemical Resistant, Water Cleanable Tile-
Setting and -Grouting Epoxy
Ceramic Porcelain Tiling

A108.8-10.....	Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout
A108.10-10.....	Grout in Tilework
A108.13-10.....	Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone
A118.1-12.....	Dry-Set Portland Cement Mortar
A118.3-13.....	Chemical Resistant, Water Cleanable Tile-Setting and –Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive
A118.4-12.....	Latex-Portland Cement Mortar
A118.5-10.....	Chemical Resistant Furan Mortars and Grouts
A118.6-10.....	Cement Grouts for Tile Installation
A118.7-10.....	High Performance Cement Grouts for Tile Installation
A118.9-10.....	Cementitious Backer Units
A118.10-14.....	Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation
A136.1-13.....	Organic Adhesives for Installation of Ceramic Tile
A137.1-12.....	American National Standard Specifications for Ceramic Tile
C. ASTM International (ASTM):	
A666-10.....	Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
A1064/A1064M-14	Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
C109/C109M-13.....	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch. or (50-mm) Cube Specimens)
C241/C241M-13.....	Abrasion Resistance of Stone Subjected to Foot Traffic
C348-14.....	Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
C627-10.....	Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
C954-11.....	Steel Drill Screws for the Application of Gypsum Board on Metal Plaster Base to Steel Studs from 0.033 in (0.84 mm) to 0.112 in (2.84 mm) in thickness
C979/C979M-10.....	Pigments for Integrally Colored Concrete
C1002-14.....	Steel Self-Piercing Tapping Screws for the Application of Panel Products
C1027-09.....	Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
C1127-01(R2009)	Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface
C1178/C1178M-13.....	Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel

Ceramic Porcelain Tiling

- C1325-14.....Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units
- C1353/C1353M-09(R2013)...Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform, Double-Head Abraser
- D1204-14.....Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheet or Film at Elevated Temperature
- D2240-05(R2010)Test Method for Rubber Property – Durometer Hardness
- D2497-07(R2012)Tolerances for Manufactured Organic-Base Filament Single Yarns
- D3045-92(R2010)Heat Aging of Plastics Without Load
- D4397-10.....Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
- D5109-12.....Standard Test Methods for Copper-Clad Thermosetting Laminates for Printed Wiring Boards
- D. Code of Federal Regulation (CFR):
40 CFR 59Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating
- E. Marble Institute of America (MIA): Design Manual III-2007
- F. Tile Council of North America, Inc. (TCNA):
Handbook for Ceramic Tile Installation (2014)
DCOF AcuTest-2012.....Dynamic Coefficient of Friction Test

PART 2 - PRODUCTS

2.1 TILE:

- A. Comply with ANSI A137.1, Standard Grade, except as modified:
1. Inspection procedures listed under the Appendix of ANSI A137.1.
 2. Abrasion Resistance Classification:
 - a. Tested in accordance with values listed in Table 1, ASTM C1027.
 - b. Class V, 12000 revolutions for floors in Corridors, Kitchens, Storage including Refrigerated Rooms
 - c. Class IV, 6000 revolutions for remaining areas.
 3. Slip Resistant Tile for Floors:
 - a. Coefficient of friction, when tested in accordance with ANSI A137.1 and measured per the TCNA DCOF AcuTest.
 - 1) Equal to or greater than .42 for level interior tile floors that will be walked on when wet.
 - b. Tile Having Abrasive Grains:
 - 1) Unglazed Ceramic Mosaic Tile: Abrasive grains throughout body of the tile.
 - 2) Quarry Tile: Abrasive grains uniformly embedded in face at rate of approximately 7.5 percent of surface area.
 - c. Porcelain Paver Tile: Matte surface finish.
 4. Mosaic tile may be mounted or joined together by a resinous bonding material along tile edges.
 5. Back mounted tiles in showers. Provide certification that the factory mounted tile has been used successfully in service at three (3) projects and is suitable for wet locations.
 6. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one (1) package

show the same range in colors as those taken from other packages and match approved samples.

7. Factory-Applied Temporary Protective Coating:
 - a. Protect exposed face surfaces (top surface) of tile against adherence of mortar and grout by pre-coating with a continuous film of hot applied petroleum paraffin wax.
 - b. Do not coat unexposed tile surfaces.
 - c. Pre-wax tiles set or grouted with or latex modified mortars.
- B. Unglazed Ceramic Mosaic Tile: Nominal 6 mm (1/4 inch) thick with cushion edges.
- C. Glazed Wall Tile: Cushion edges, glazing.
- D. Porcelain Paver Tile: Nominal 8 mm (5/16 inch) thick, with cushion edges. Porcelain tile produced by the dust pressed method are to be made of approximately 50% feldspar; the remaining 50% is to be made up of various high-quality light firing ball clays yielding a tile with a water absorption rate of 0.5% or less and a breaking strength of between 176 to 181 kg (390 to 400 lbs.).
- E. Trim Shapes:
 1. Conform to applicable requirements of adjoining floor and wall tile.
 2. Use slip resistant trim shapes for horizontal surfaces of showers overflow ledges, recessed steps, shower curbs, drying area curbs, and seats.
 3. Use trim shapes sizes conforming to size of adjoining field wall tile unless detailed on construction documents or specified otherwise.
 4. Internal and External Corners:
 - a. Square internal and external corner joints are not acceptable.
 - b. External corners including edges: Use bullnose shapes.
 - c. Internal corners: Use cove shapes.
 - d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.
 - e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.
 - f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.
 - g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.
 - h. For unglazed ceramic mosaic and glazed wall tile installed in portland cement mortar setting bed, use cove and bullnose shapes as applicable. When ceramic mosaic wall and base tile is required, use C Series cove and bullnose shapes.
 - i. For unglazed ceramic mosaic and glazed wall tile installed in dry-set portland cement mortar, latex-portland cement mortar, and organic adhesive (thin set methods), use cove and surface bullnose shapes as applicable.
 - j. For quarry tile work, use cove and bullnose shapes as applicable.
 - k. Provide cove and bullnose shapes for countertops, stools, saddles, / where indicated in construction documents and required to complete tile work.

2.2 SETTING MATERIALS OR BOND COATS:

- A. Conform to TCNA Handbook for Ceramic Tile Installation.
- B. Portland Cement Mortar: ANSI A108.02.
- C. Latex-Portland Cement Mortar: ANSI A118.4.
 1. For wall applications, provide non-sagging, latex-portland cement mortar complying with ANSI A118.4.

2. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
- D. Dry-Set Portland Cement Mortar: ANSI A118.1. For wall applications, provide non-sagging, latex-portland cement mortar complying with ANSI A118.1.
- E. Organic Adhesives: ANSI A136.1, Type 1.
- F. Chemical-Resistant Bond Coat:
 1. Epoxy Resin Type: ANSI A118.3.
- G. Elastomeric Waterproofing Membrane and Bond Coat:
 1. TCNA F122-14 (on ground concrete) and TCNA F112A-14 (above ground concrete).
 2. ANSI A118.10.
 3. One component polyurethane, liquid applied material having the following additional physical properties:
 - a. Hardness: Shore "A" between 40-60.
 - b. Elongation: Between 300-600 percent.
 - c. Tensile strength: Between .27 - .41 Newton per square millimeter (40-60 pounds per square inch gauge).
 - d. No volatile compounds (VOC).
 4. Coal tar modified urethanes are not acceptable.
- H. Waterproofing Isolation Membrane:
 1. Sheet System TCNA F122-14 (on-ground concrete) and TCNA F122A-14 (above-ground concrete).
 2. Composite sheet consisting of ASTM D5109, Type II, Grade I Chlorinated Polyethylene (CM) sheet reinforced on both sides with a non-woven polyester fiber.
 3. Designed for use in wet areas as an isolation and positive waterproofing membranes for thin-set bonding of sheet to substrate and thin-set bonding of ceramic and porcelain tile or marble to sheet. Suited for both horizontal and vertical applications.
 4. Conform to the following additional physical properties:

Property	Units	Results	Test Method
Hardness Shore A	Points	70-80	ASTM D2240 (10 Second Reading)
Shrinkage	Percent	5 maximum	ASTM D1204
Brittleness		No crack remains flexible at temperature -37 degrees C (-35 degrees F)	ASTM D2497 13 mm (1/2-inch) Mandrel Bend
Retention of Properties after Heat Aging	Percent of original	80 Tensile 80 Breaking 80 Elongation	ASTM D3045, 90 degrees C (194 degrees F) for 168 hours
5. Manufacturer's standard sheet size with prefabricated or preformed inside and outside corners.
6. Sheet manufacturer's solvent welding liquid or xylene and edge sealant.

2.3 GROUTING MATERIALS:

- A. Coloring Pigments:
 1. Pure mineral pigments, lime proof and nonfading, complying with ASTM C979/C979M.
 2. Coloring pigments may only be added to grout by the manufacturer.

3. Job colored grout is not acceptable.
 4. Use is required in Commercial Portland Cement Grout, Dry-Set Grout, and Latex-Portland Cement Grout.
- B. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated. Zero VOC content.
- C. Standard Cement Grout: ANSI A118.6.
- D. High Performance Tile Grout: ANSI A118.7 with a VOC content of 65 g/L or less when calculated according to 40 CFR 59 (EPA Method 24) .
1. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
 2. Polymer Type: styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
- E. Water-Cleanable Epoxy Grout: ANSI A118.3 , with a VOC content of 65 g/L or less when calculated according to 40 CFR 59 (EPA Method 24) .
1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 60 and 100 degrees C (140 and 212 degrees F), respectively, and certified by manufacturer for intended use.

2.4 PATCHING AND LEVELING COMPOUND:

- A. Portland cement base, polymer-modified, self-leveling compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- B. Provide a patching and leveling compound with the following minimum physical properties:
1. Compressive strength - 25 MPa (3500 psig) per ASTM C109/C109M.
 2. Flexural strength - 7 MPa (1000 psig) per ASTM C348 (28 day value).
 3. Tensile strength – 4.1 MPa (600 psi) per ANSI 118.7.
 4. Density – 1.9.
- C. Capable of being applied in layers up to 38 mm (1-1/2 inches) thick without fillers and up to 101 mm (4 inches) thick with fillers, being brought to a feather edge, and being trowelled to a smooth finish.
- D. Primers, fillers, and reinforcement as required by manufacturer for application and substrate condition.
- E. Ready for use in 48 hours after application.

2.5 METAL DIVIDER STRIPS:

- A. Terrazzo type divider strips.
- B. Heavy top type strip with 5 mm (3/16 inch) wide top and 38 mm (1 1/2 inch) long leg. Height to match tile and setting-bed thickness.
- C. Embedded leg perforated and deformed for keying to mortar.
- D. Stainless-steel, ASTM A666, 300 Series exposed-edge material.

2.6 WATER:

- A. Clean, potable and free from salts and other injurious elements to mortar and grout materials.

2.7 CLEANING COMPOUNDS:

- A. Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- B. Materials containing acid or caustic Material are not acceptable.

2.8 FLOOR MORTAR BED REINFORCING:

- A. ASTM A1064/A1064M welded wire fabric without backing, MW3 x MW3 (2 x 2-W0.5 x W0.5).

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS:

- A. Maintain ambient temperature of work areas at not less than 16 degrees C (60 degrees F), without interruption, for not less than 24 hours before installation and not less than three (3) days after installation.
- B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation and ANSI Specifications for installation.
- C. Do not install tile when the temperature is above 38 degrees C (100 degrees F).
- D. Do not install materials when the temperature of the substrate is below 16 degrees C (60 degrees F).
- E. Do not allow temperature to fall below 10 degrees C (50 degrees F) after third day of completion of tile work.

3.2 ALLOWABLE TOLERANCE:

- A. Variation in plane of sub-floor, including concrete fills leveling compounds and mortar beds:
1. Not more than 6 mm in 3048 mm (1/4 inch in 10 feet) from required elevation where portland cement mortar setting bed is used.
 2. Not more than 3 mm in 3048 mm (1/8 inch in 10 feet) where dry-set portland cement, and latex-portland cement mortar setting beds and chemical-resistant bond coats are used.
- B. Variation in Plane of Wall Surfaces:
1. Not more than 6 mm in 2438 mm (1/4 inch in 8 feet) from required plane where portland cement mortar setting bed is used.
 2. Not more than 3 mm in 2438 mm (1/8 inch in 8 feet) where dry-set or latex-portland cement mortar or organic adhesive setting materials is used.

3.3 SURFACE PREPARATION:

- A. Cleaning New Concrete or Masonry:
1. Chip out loose material, clean off all oil, grease dirt, adhesives, curing compounds, and other deterrents to bonding by mechanical method, or by using products specifically designed for cleaning concrete and masonry.
 2. Use self-contained power blast cleaning systems to remove curing compounds and steel trowel finish from concrete slabs where ceramic tile will be installed directly on concrete surface with thin-set materials.
 3. Steam cleaning or the use of acids and solvents for cleaning will not be permitted.
- B. Patching and Leveling:
1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.
 2. Fill holes and cracks and align concrete floors that are out of required plane with patching and leveling compound.
 - a. Thickness of compound as required to bring finish tile system to elevation shown on construction documents.
 - b. Float finish except finish smooth for elastomeric waterproofing .
 - c. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
 3. Apply patching and leveling compound to concrete and masonry wall surfaces that are out of required plane.

4. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.
- C. Mortar Bed for Slopes to Drains:
 1. Slope compound to drain where drains are shown on construction documents.
 2. Install mortar bed in depressed slab sloped to drains not less than 3.2 mm in 305 mm (1/8 inch per foot).
 3. Allow not less than 50 mm (2 inch) depression at edge of depressed slab.
 4. Screed for slope to drain and float finish.
 5. Cure mortar bed for not less than seven (7) days. Do not use curing compounds or coatings.
 6. Perform flood test to verify mortar bed slopes to drain before installing tile. Contracting Officer Representative (COR) to be present during flood test.
- D. Additional preparation of concrete floors for tile set with epoxy, or furan-resin is to be in accordance with the manufacturer's printed instructions.
- E. Cleavage Membrane:
 1. Install polythene sheet as cleavage membrane in depressed slab when waterproof membrane is not scheduled or indicated.
 2. Turn up at edge of depressed floor slab to top of floor.
- F. Walls:
 1. In showers or other wet areas cover studs with polyethylene sheet.
 2. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.
 3. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.
 4. Apply metal lath to framing in accordance with ANSI A108.1:
 - a. Use fasteners specified in paragraph "Fasteners." Use washers when lath opening is larger than screw head.
 - b. Apply scratch and leveling coats to metal lath in accordance with ANSI A108.1C.
 - c. Total thickness of scratch and leveling coats:
 - 1) Apply 9 mm to 16 mm (3/8 inch to 5/8 inch) thick over solid backing.
 - 2) 16 mm to 19 mm (5/8 to 3/4 inch) thick on metal lath over studs.
 - 3) Where wainscots are required to finish flush with wall surface above, adjust thickness required for flush finish.
 - d. Apply scratch and leveling coats more than 19 mm (3/4 inch) thick in two (2) coats.

3.4 GLASS MAT WATER-RESISTANT BACKING BOARD:

- A. Install in accordance Section 09 29 00 and with manufacturer's instructions. TCNA Systems W245-1.

3.5 METAL DIVIDER STRIPS:

- A. Install metal divider strips in floor joints between ceramic and quarry tile floors and between tile floors and adjacent flooring of other materials where the finish floors are flush unless shown otherwise on construction documents.
- B. Set divider strip in mortar bed to line and level centered under doors or in openings.
- C. At preformed sealant joint: Refer to Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
 1. Comply with recommendations in TCNA for Vertical and Horizontal Joint Design Essentials. TCNA Systems EJ 171.
 - a. Locate joint in tile surfaces directly above joint in sub-floor or where indicated when used with isolation membranes to allow off-setting of joint location from sub-floor joint.
 - b. Fasten full length to sub-floor using a construction adhesive.

- c. Trowel setting material with full coverage over the entire leg.
2. Set tile up against the joint ensuring that the top edge of the joint is flush or slightly below the top of the tile.

3.6 CERAMIC TILE – GENERAL:

- A. Comply with ANSI A108/A118/A136 series of tile installation standards applicable to methods of installation and TCNA Installation Guidelines.
- B. Installing Mortar Beds for Floors:
 1. Install mortar bed in a manner that does not damage cleavage or waterproof membrane; 32 mm (1-1/2 inch) minimum thickness.
 2. Install floor mortar bed reinforcing centered in mortar fill.
 3. Screed finish to level plane or slope to drains shown on construction documents, float finish.
 4. For thin set systems cure mortar bed not less than seven (7) days. Do not use curing compounds or coatings.
 5. For tile set with portland cement paste over plastic mortar bed coordinate to set tile before mortar bed sets.
- C. Setting Beds or Bond Coats:
 1. Where recessed or depressed floor slabs are filled with portland cement mortar bed, set ceramic mosaic floor tile in either portland cement paste over plastic mortar bed or latex-portland cement mortar over cured mortar bed except as specified otherwise, ANSI A108-1C, TCNA System F121-14 or F111-14.
 2. Use quarry tile in chemical-resistant bond coat .
 - a. Portland cement paste over plastic mortar bed. ANSI A108.1A.
 - b. Dry-set portland cement mortar over cured mortar bed. ANSI A108.1B.
 3. Set tile installed over gypsum board and gypsum plaster in organic adhesive, ANSI A108.1, TCNA System W242-14.
 4. Set trim shapes in same material specified for setting adjoining tile.
- D. Workmanship:
 1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.
 2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise on construction documents.
 3. Form intersections and returns accurately.
 4. Cut and drill tile neatly without marring surface.
 5. Cut edges of tile abutting penetrations, finish, or built-in items:
 - a. Fit tile closely around electrical outlets, piping, fixtures and fittings, so that plates, escutcheons, collars and flanges will overlap cut edge of tile.
 - b. Seal tile joints water tight as specified in Section 07 92 00, JOINT SEALANTS, around electrical outlets, piping fixtures and fittings before cover plates and escutcheons are set in place.
 6. Completed work is to be free from hollow sounding areas and loose, cracked or defective tile.
 7. Remove and reset tiles that are out of plane or misaligned.
 8. Floors:
 - a. Extend floor tile beneath casework and equipment, except those units mounted in wall recesses.
 - b. Align finish surface of new tile work flush with other and existing adjoining floor finish where indicated in construction documents.
 - c. In areas where floor drains occur, slope tile to drains.
 - d. Push and vibrate tiles over 203 mm (8 inches) square to achieve full support of bond coat.
 9. Walls:

- a. Cover walls and partitions, including pilasters, furred areas, and freestanding columns from floor to ceiling, or from floor to nominal wainscot heights as indicated in construction documents with tile.
 - b. Finish reveals of openings with tile, except where other finish materials are indicated in construction documents.
 - c. At window openings, provide tile stools and reveals.
 - d. Finish wall surfaces behind and at sides of casework and equipment, except those units mounted in wall recesses, with same tile as scheduled for room proper.
10. Joints:
- a. Keep all joints in line, straight, level, perpendicular and of even width unless shown otherwise on construction documents.
 - b. Make joints 2 mm (1/16 inch) wide for glazed wall tile and mosaic tile work.
 - c. Make joints in quarry tile work not less than 6 mm (1/4 inch) nor more than 9 mm (3/8 inch) wide. Finish joints flush with surface of tile.
 - d. Make joints in paver tile, porcelain type; maximum 3 mm (1/8 inch) wide.
11. Back Buttering: For installations indicated below, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108/A118/A136 series of tile installation standards:
- a. Tile wall installations in wet areas, including showers, tub enclosures, laundries and swimming pools.
 - b. Tile installed with chemical-resistant mortars and grouts.
 - c. Tile wall installations composed of tiles 203 by 203 mm (8 by 8 inches) or larger.
 - d. Exterior tile wall installations.

3.7 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH DRY-SET PORTLAND CEMENT AND LATEX-PORTLAND CEMENT MORTAR:

- A. Installation of Tile: ANSI A108.1B, except as specified otherwise.
- B. Slope tile work to drains at not less than 3 mm in 305 mm (1/8 inch per foot).

3.8 GROUTING:

- A. Grout Type and Location:
 - 1. Grout for glazed wall and base tile, paver tile and unglazed mosaic tile portland cement grout, latex-portland cement grout, dry-set grout, or commercial portland cement grout.
 - 2. Grout for quarry tile floor and base:
 - a. Grout for floors of walk-in refrigerated rooms: Epoxy grout.
 - b. Therapeutic pool areas: Portland cement grout.
 - c. Grout for Kitchens:
 - 1) Chemical-resistant grout as specified and recommended by manufacturer of bond coat.
 - 2) Use only furan resin grout within 609 mm (2 feet) of ovens, steam kettles, water heaters, steam pipes in rooms.
 - 3) Epoxy grout designed for equivalent heat resistance to furan resin grout may be used for furan resin grout.
 - 3. Grout for tile of therapeutic pools: Portland cement grout.
- B. Workmanship:
 - 1. Install and cure grout in accordance with the applicable standard.
 - 2. Sand Portland Cement Grout: ANSI A108.10.
 - 3. Standard Cement Grout: ANSI A118.6.
 - 4. High Performance Grout: ANSI A118.7.
 - 5. Epoxy Grout: ANSI A108.6.
 - 6. Water-Cleanable Epoxy Grout: ANSI A118.3.
 - 7. Furan and Commercial Portland Cement Grout: ANSI A118.5 and in accordance with the manufacturer's printed instructions.

3.9 MOVEMENT JOINTS:

- A. Prepare tile expansion, isolation, construction, and contraction joints for installation of sealant. Refer to Section 07 92 00, JOINT SEALANTS.
- B. TCNA details EJ 171-14.
- C. At expansion joints, rake out joint full depth of tile and setting bed and mortar bed. Do not cut waterproof or isolation membrane.
- D. Rake out grout at joints between tile, service sink, at toe of base, and where indicated in construction documents not less than 6 mm (1/4 inch) deep.

3.10 CLEANING:

- A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.
- B. Methods and materials used are not permitted to damage or impair appearance of tile surfaces.
- C. The use of acid or acid cleaners on glazed tile surfaces is prohibited.
- D. Clean tile grouted with epoxy, furan and commercial portland cement grout and tile set in elastomeric bond coat as recommended by the manufacturer of the grout and bond coat.

3.11 PROTECTION:

- A. Keep traffic off tile floor, until grout and setting material is fully set and cured.
- B. Where traffic occurs over tile floor is unavoidable, cover tile floor with not less than 9 mm (3/8 inch) thick plywood, wood particle board, or hardboard securely taped in place. Do not remove protective cover until time for final inspection. Clean tile of any tape, adhesive and stains.

3.12 TESTING FINISH FLOOR:

- A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.

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SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Acoustical units.
 - 2. Metal ceiling suspension system for acoustical ceilings.
 - 3. Adhesive application.

1.2 RELATED REQUIREMENTS

- A. Adhesive VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Color, pattern, and location of each type of acoustical unit: See construction documents
- C. Access doors in adhesive applied tile: Section 08 31 13, ACCESS DOORS AND FRAMES.
- D. Ceiling Suspension System: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- E. Lay in gypsum board ceiling panels: Section 09 29 00, GYPSUM BOARD.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - 1. A641/A641M-09a(2014) - Zinc-coated (Galvanized) Carbon Steel Wire.
 - 2. A653/A653M-15e1 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
 - 3. C423-09a - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 4. C634-13 - Terminology Relating to Environmental Acoustics.
 - 5. C635/C635M-13a - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
 - 6. C636/C636M-13 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
 - 7. D1779-98(2011) - Adhesive for Acoustical Materials.
 - 8. E84-15b - Surface Burning Characteristics of Building Materials.
 - 9. E119-16 - Fire Tests of Building Construction and Materials.
 - 10. E413-16 - Classification for Rating Sound Insulation.
 - 11. E580/E580M-14 - Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
 - 12. E1264-14 - Classification for Acoustical Ceiling Products.
- C. International Organization for Standardization (ISO):
 - 1. ISO 14644-1 - Classification of Air Cleanliness.

1.4 PREINSTALLATION MEETINGS

- A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
 - 1. Required Participants:
 - a. Contracting Officer's Representative.
 - b. VA Interior Designer.
 - c. Contractor.
 - d. Installer.

- e. Other installers responsible for adjacent and intersecting work, including sprinkler HVAC and lighting installers.
- 2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
 - a. Installation schedule.
 - b. Installation sequence.
 - c. Preparatory work.
 - d. Protection before, during, and after installation.
 - e. Installation.
 - f. Terminations.
 - g. Transitions and connections to other work.
 - h. Inspecting and testing.
 - i. Other items affecting successful completion.
- 3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
 - 1. Show size, configuration, and fabrication and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Ceiling suspension system indicating manufacturer recommendation for each application.
 - 3. Installation instructions.
 - 4. Warranty.
- D. Samples:
 - 1. Acoustical units, 150 mm (6 inches) in size, each type.
 - a. Submit quantity required to show full color and texture range.
 - 2. Suspension system, trim and molding, 300 mm (12 inches) long.
 - 3. Colored markers for access service.
 - 4. Approved samples may be incorporated into work.
- E. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 - 2. Biobased Content:
 - a. Show type and quantity for each product.
 - b. Show volatile organic compound types and quantities.
- F. Certificates: Certify products comply with specifications.
 - 1. Acoustical units, each type.
- G. Qualifications: Substantiate qualifications comply with specifications.
 - 1. Manufacturer with project experience list .
- H. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Regularly manufactures specified products.
 - 2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
 - a. Project Experience List: Provide contact names and addresses for completed projects.

1.7 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight conditioned facility.
- B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
 - 2. Work Area Ambient Conditions: HVAC systems are complete, operational, and maintaining facility design operating conditions continuously, beginning 48 hours before installation until Government occupancy.
 - 3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.10 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Ceiling System: Acoustical ceilings units on exposed grid suspension systems.

2.2 SYSTEM PERFORMANCE

- A. Design product complying with specified performance:
 - 1. Maximum Deflection: 1/360 of span, maximum.
- B. Surface Burning Characteristics: When tested according to ASTM E84.
 - 1. Flame Spread Rating: 25 maximum.
 - 2. Smoke Developed Rating: 450 maximum.

2.3 PRODUCTS - GENERAL

- A. Basis of Design: See Construction Documents.
- B. Provide acoustical units from one manufacturer.
 - 1. Provide each product exposed to view from one production run.
- C. Provide suspension system from same manufacturer.
- D. Sustainable Construction Requirements:
 - 1. Mineral Base Recycled Content: 76% percent, total recycled content, minimum.
 - 2. Steel Recycled Content: 30 percent total recycled content, minimum.
 - 3. Aluminum Recycled Content: 50 percent total recycled content, minimum.
 - 4. Biobased Content: 37 percent by weight biobased material, minimum.
 - 5. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-flooring adhesives and sealants.

2.4 ACOUSTICAL UNITS

A. General:

1. Ceiling Panel and Tile: ASTM E1264, bio-based content according to USDA Bio-Preferred Product requirements.
 - a. Mineral Fiber: 3.6 kg/sq. m (3/4 psf) weight, minimum.
2. Classification: Provide type and form as follows:
 - a. Type III Units - Mineral base with water-based painted finish maximum 10 g/l VOC; Form 2 - Water felted, minimum 16 mm (5/8 inch) thick.
 - b. Type IV Units - Mineral base with membrane-faced overlay, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Apply poly (vinyl) chloride over paint coat.
 - c. Type V Units - Perforated steel facing (pan) with mineral or glass fiber base backing.
 - 1) Steel: Galvanized steel, ASTM A653, with G30 coating. minimum 0.38 mm (0.015 inch) thick.
 - 2) Bonderize both sides. Apply two coats of baked-on enamel finish on surfaces exposed to view and one coat on concealed surfaces.
 - d. Type VI Units - Perforated stainless steel facing (pan) with mineral or glass fiber base backing.
 - e. Type VII Units - Perforated aluminum facing (pan) with mineral or glass fiber base backing.
 - 1) Aluminum sheets, minimum 0.635 mm (0.025 inch) thick.
 - 2) Apply two coats of baked-on enamel finish, free from gloss or sheen, on face and flanges.
 - f. NRC (Noise Reduction Coefficient): ASTM C423, minimum 0.55 unless specified otherwise.
 - g. CAC (Ceiling Attenuation Class): ASTM E413, 40-44 range unless specified otherwise.
 - h. LR (Light Reflectance): Minimum 0.75.
3. Lay-in panels: Sizes as indicated on Drawings, with square edges .
 - a. Sizes:
 - 1) Concealed Grid Upward Access System: 300 by 600 mm (12 by 24 inch) .
 - 2) Cross Score: 300 by 600 mm (12 by 24 inch) tile to simulate 300 by 300 mm (12 by 12 inch) tile edges.
 - 3) Edge and Joint Detail: Square edges and joints as required to suit suspension and access system.
4. Perforated Metal Facing (Pan):
 - a. Tiles Size: 300 by 600 (12 by 24) .
 - 1) Cross Score Units: Larger than 300 by 300 mm (12 by 12 inches) to simulate 300 by 300 mm (12 by 12 inch) units.
 - 2) Edge and Joint Detail: Beveled edge, joints for snap-in attachment to suspension system.
 - b. Panels: Sizes as indicated on Drawings with flat panel with square edges to finish flush with exposed grid suspension system. /
 - c. Sound Absorbent Element: Non-sifting mineral wool or glass fiber (formaldehyde-free). Density and thickness to provide specified noise reduction coefficient. Enclose sound absorbent elements within plastic envelopes.
 - d. Support sound absorbent elements on wire spacer nominal 6 mm (1/4 inch) high. Fit sound absorbent element and the spacer into the unit.
5. Adhesive Applied Tile:
 - a. Size: 300 by 300 mm (12 by 12 inch) size.
 - b. Edges: Square .

- B. SPECIAL FACED ACOUSTICAL TILE UNITS AT(SP): Anti-microbial coated surfaces suitable for use in Class 5 Clean Rooms per ISO 14644-1. Special faced acoustical tile units shall meet all general requirements stated in this specification.

1. Type XX-A Units - Perforated Ceramic Units for Wet Service.
 - a. Mineral wool material, fired in kiln to produce a stable panel, totally unaffected by moisture when submerged in water.
 - b. No damage when subjected to 10 cycles of steam at 135 degrees C (275 degrees F) and cooling to 10 degrees C (50 degrees F).
 - c. Minimum of 16 mm (5/8 inch) thick.
 - d. Not affected when immersed in five percent chlorine solution, except for paint finish.
2. Type III-A Units - Mineral base with painted finish.
 - a. Form 1, modular, cast or molded.
 - b. NRC: 0.75 minimum.
 - c. Thickness: 19 mm (3/4 inch) minimum.
 - d. Weight, 4.9 kg/sq. m (one pound per square foot).
3. Type XX-B Units - Combination mineral base and glass fiber with fabric finish.
 - a. Back Half of Panel: Perforated water felted mineral fiber.
 - b. Face Half of Panel: Glass fiber with glass cloth face.
 - c. NRC: 0.75 minimum.
 - d. Thickness: 28 mm (1 1/8 inches) minimum.

2.5 METAL SUSPENSION SYSTEM

- A. General: ASTM C635, heavy-duty system, except as otherwise specified.
 1. Suspension System: Provide the following:
 - a. Galvanized cold-rolled steel, bonderized.
 2. Main and Cross Runner: Use same construction Do not use lighter-duty sections for cross runners.
- B. Exposed Grid Suspension System: Support of lay-in panels.
 1. Grid Width: 22 mm (7/8 inch) minimum with 8 mm (5/16 inch) minimum panel bearing surface.
 2. Molding: Fabricate from the same material with same exposed width and finish.
 3. Finish: Baked-on enamel flat texture finish.
 - a. Color: To match adjacent acoustical units unless specified otherwise on Construction Documents.
- C. Concealed Grid Suspension System: Mineral base acoustical tile support.
 1. Concealed grid upward access suspension system initial opening, 300 mm by 600 mm (12 by 24 inches).
 2. Flange Width: 22 mm (7/8 inch) minimum except:
 - a. Access Hook and Angle: 11 mm (7/16 inch) minimum.
- D. Suspension System Support of Metal Type V, VI, and VII Tiles: Concealed grid type with runners for snap-in attachment of metal tile (pans).
- E. Carrying Channels Secondary Framing: Cold-rolled or hot-rolled steel, black asphaltic paint finish, rust free.
 1. Weight per 300 m (per thousand linear feet), minimum:

Size		Cold-rolled		Hot-rolled	
mm	inches	kg	pound	kg	pound
38	1-1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

- F. Anchors and Inserts: Provide anchors or inserts to support twice the loads imposed by hangers.
 1. Hanger Inserts: Steel, zinc-coated (galvanized after fabrication).
 - a. Nailing type option for wood forms:
 - 1) Upper portion designed for anchorage in concrete and positioning lower portion below surface of concrete approximately 25 mm (one inch).

- 2) Lower portion provided with minimum 8 mm (5/16 inch) hole to permit attachment of hangers.
- b. Flush ceiling insert type:
 - 1) Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
 - 2) Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
 - 3) Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.
- G. Clips: Galvanized steel, designed to secure framing member in place.
- H. Tile Splines: ASTM C635.
- I. Wire: ASTM A641.
 - 1. Size:
 - a. Wire Hangers: Minimum diameter 2.68 mm (0.1055 inch).
 - b. Bracing Wires: Minimum diameter 3.43 mm (0.1350 inch).

2.6 ACCESSORIES

- A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.
- B. Perimeter Seal: Vinyl, polyethylene or polyurethane open cell sponge material, density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.
 - 1. Thickness: As required to fill voids between back of wall molding and finish wall.
 - 2. Size: Minimum 9 mm (3/8 inch) wide strip.
- C. Access Identification Markers: Colored markers with pressure sensitive adhesive on one side, paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) diameter.
 - 1. Color Code: Provide the following color markers for service identification:

Color	Service
Red	Sprinkler System: Valves and Controls
Green	Domestic Water: Valves and Controls
Yellow	Chilled Water and Heating Water
Orange	Ductwork: Fire Dampers
Blue	Ductwork: Dampers and Controls
Black	Gas: Laboratory, Medical, Air and Vacuum

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 ACOUSTICAL UNIT INSTALLATION

- A. Applications:
 - 1. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.

- B. Layout acoustical unit symmetrically, with minimum number of joints.
- C. Installation:
 - 1. Install acoustic tiles after wet finishes have been installed and solvents have cured.
 - 2. Install lay-in acoustic panels in exposed grid with minimum 6 mm (1/4 inch) bearing at edges on supports.
 - a. Install tile to lay level and in full contact with exposed grid.
 - b. Replace cracked, broken, stained, dirty, or tile.
 - 3. Tile in concealed grid upward access suspension system:
 - a. Install acoustical tile with joints close, straight and true to line, and with exposed surfaces level and flush at joints.
 - b. Make corners and arises full, and without worn or broken places.
 - c. Locate acoustical units providing access to service systems.
 - 4. Adhesive applied tile:
 - a. Condition of surface according to ASTM D1779, Note 1, Cleanliness of Surface, and Note 4, Rigidity of Base Surface.
 - b. Size or seal surface as recommended by manufacturer of adhesive and allow to dry before installing units.
 - 5. Markers:
 - a. Install color coded markers to identify the various concealed piping, mechanical, and plumbing systems.
 - b. Attach colored markers to exposed grid on opposite sides of the units providing access.
 - c. Attach marker on exposed ceiling surface of upward access acoustical unit.
- D. Touch up damaged factory finishes.
 - 1. Repair painted surfaces with touch up primer.

3.4 CEILING SUSPENSION SYSTEM INSTALLATION

- A. General: Install according to ASTM C636.
 - 1. Use direct or indirect hung suspension system or combination of both.
 - 2. Support a maximum area of 1.48 sq. m (16 sq. ft.) of ceiling per hanger.
 - 3. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
 - 4. Provide additional hangers located at each corner of support components.
 - 5. Provide minimum 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown.
 - 6. Provide main runners minimum 1200 mm (48 inches) in length.
 - 7. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.
- B. Direct Hung Suspension System: ASTM C635.
 - 1. Support main runners by hanger wires attached directly to the structure overhead.
 - 2. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.
- C. Anchorage to Structure:
 - 1. Steel:
 - a. Install carrying channels for attachment of hanger wires.
 - 1) Size and space carrying channels to support load within performance limit.
 - 2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.
 - b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fireproofing is installed. Weld or use steel clips for beam attachment.

- c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of the bottom chord of the bar joists, and securely wire tie or clip to joist.
- D. Indirect Hung Suspension System: ASTM C635.
 - 1. Space carrying channels for indirect hung suspension system maximum 1200 mm (4 feet) on center. Space hangers for carrying channels maximum 2400 mm (8 feet) on center or for carrying channels less than 1200 mm (4 feet) on center so as to insure that specified requirements are not exceeded.
 - 2. Support main runners by specially designed clips attached to carrying channels.
- E. Seismic Ceiling Bracing System:
 - 1. Install according to ASTM E580.
 - 2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner or carrying channels of suspended ceiling at bottom.

3.5 CEILING TREATMENT

- A. Moldings:
 - 1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
 - 2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.
- B. Perimeter Seal:
 - 1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.
 - 2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.
- C. Existing ceiling:
 - 1. Where extension of existing ceilings occurs, match existing.
 - 2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units within a space which results in contrast between old and new acoustic units.
 - 3. Comply with specifications for new acoustical units for new units required to match appearance of existing units.

3.6 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed surfaces. Remove contaminants and stains.

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SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base (RB) adhered to interior walls and partitions.

1.2 RELATED REQUIREMENTS

- A. Rubber Tile Flooring at Landings: Section 09 65 19, RESILIENT TILE FLOORING.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 - 1. F1344-15 - Rubber Floor Tile.
 - 2. F1859-14 - Rubber Sheet Floor Covering without Backing.
 - 3. F1860-14 - Rubber Sheet Floor Covering with Backing.
 - 4. F1861-08(2012)e1 - Resilient Wall Base.
 - 5. D4259-88(2012) - Abrading Concrete.
- C. Federal Specifications (Fed. Spec.):
 - 1. RR-T-650E - Treads, Metallic and Non-Metallic, Skid-Resistant.
- D. International Concrete Repair Institute (ICRI):
 - 1. 310.2R-13 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Adhesives and primers indicating manufacturer's recommendation for each application.
 - 3. Installation instructions.
- C. Samples:
 - 1. Resilient Base: 150 mm (6 inches) long, each type and color.
- D. Sustainable Construction Submittals:
 - 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 - 2. Low Pollutant-Emitting Materials:
 - a. Stair Treads and Sheet Rubber Flooring: Submit FloorScore label.
 - b. Show volatile organic compound types and quantities.
- E. Operation and Maintenance Data:
 - 1. Care instructions for each exposed finish product.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage when handling and during construction operations.

1.7 FIELD CONDITIONS

- A. Environment:
 - 1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
 - 2. Work Area Ambient Temperature Range: 21 to 27 degrees C (70 to 80 degrees F) continuously, beginning 48 hours before installation.
 - 3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.8 WARRANTY

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Basis of Design: See Construction Documents.
- B. Provide each product from one manufacturer and from one production run.
- C. Provide resilient stair treads and sheet rubber flooring from same manufacturer.
- D. Sustainable Construction Requirements:
 - 1. Sheet Rubber Flooring Recycled Content: 90 percent total recycled content, minimum.
- E. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - 1. Flooring Adhesives and Sealants.

2.2 RESILIENT BASE

- A. Resilient Base: 3 mm (1/8 inch) thick, 100 mm (4 inches) high.
- B. Type: Rubber or vinyl; use one type throughout.
- C. ASTM F1861, Type TP thermoplastic rubber or Type TV thermoplastic vinyl, Group 2 - layered.
- D. Applications:
 - 1. Carpet Flooring Locations: Style A - Straight.
 - 2. Other Locations: Style B - Cove.

2.3 ADHESIVES

- A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

- C. Dispose of removed materials.
- D. Correct substrate deficiencies.
- E. Fill cracks, pits, and depressions with leveling compound.
- F. Remove protrusions; grind high spots.
- G. Apply leveling compound to achieve 3 mm (1/8 inch) in 3 m (10 feet) maximum surface variation.
- H. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.
- I. Mechanically clean concrete floor substrate according to ASTM D4259.
- J. Surface Profile: ICRI Guideline No. 310.2R.
- K. Allow substrate to dry and cure.
- L. Perform flooring manufacturer's recommended bond, substrate moisture content, and pH tests.

3.2 INSTALLATION GENERAL

- A. Install products according to manufacturer's instructions.
- B. When instructions deviate from specifications, submit proposed resolution for Contracting Officer consideration.

3.3 RESILIENT BASE INSTALLATION

- A. Applications:
- B. Install resilient base in rooms scheduled on Drawings.
- C. Install resilient base on casework and locker toe spaces /, and other curb supported fixed equipment.
- D. Extend resilient base into closets, alcoves, and cabinet knee spaces, and around columns within scheduled room.
- E. Lay out resilient base with minimum number of joints.
- F. Length: 600 mm (24 inches) minimum, each piece.
- G. Locate joints 150 mm (6 inches) minimum from corners and intersection of adjacent materials.
- H. Installation:
- I. Apply adhesive uniformly for full contact between resilient base and substrate.
- J. Set resilient base with hairline butted joints aligned along top edge.
- K. Factory form corners and end stops.
- L. V-groove back of outside corner.
- M. V-groove face of inside corner and notch cove for miter joint.
- N. Roll resilient base ensuring complete adhesion.

3.4 CLEANING

- A. Remove excess adhesive before adhesive sets.
- B. Clean exposed resilient base, resilient stair treads, and sheet rubber flooring surfaces. Remove contaminants and stains.
- C. Clean with mild detergent. Leave surfaces free of detergent residue.

- D. Polish exposed resilient base to gloss sheen.

3.5 PROTECTION

- A. Prohibit traffic on resilient stair treads and sheet rubber flooring 72 hours, minimum, after installation.
- B. Protect products from construction traffic and operations.
- C. Cover resilient stair treads and sheet rubber flooring with reinforced kraft paper, and plywood or hardboard.
- D. Maintain protection until directed by Contracting Officer's Representative.
- E. Replace damaged products and re-clean.
- F. Damaged Products include cut, gouged, scraped, torn, and unbonded products.

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SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies the installation of luxury vinyl tile, and accessories required for a complete installation.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- C. Subfloor Testing and Preparation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.
- D. Color, Pattern and Texture for Resilient Tile Flooring and Accessories: See Construction Documents.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as described in PART 2 - PRODUCTS.
 - 2. Postconsumer and preconsumer recycled content as described in PART 2 - PRODUCTS.
- C. Manufacturer's Literature and Data:
 - 1. Description of each product.
 - 2. Resilient material manufacturer's recommendations for adhesives, underlayment, primers, and polish.
 - 3. Application, installation and maintenance instructions.
- D. Samples:
 - 1. Tile: Each type, color, thickness and finish.
 - 2. Edge Strips: Each type, color, thickness and finish.
 - 3. Feature Strips: Each type, color, thickness and finish.
- E. Shop Drawings:
 - 1. Layout of patterns as shown on the construction documents.
 - 2. Edge strip locations showing types and detail cross sections.
- F. Test Reports:
 - 1. Abrasion resistance: Depth of wear for each tile type and color and volume loss of tile, certified by independent laboratory. Tested per ASTM F510/F510M.
 - 2. Moisture and pH test results as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

1.4 DELIVERY:

- A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
- B. Materials from containers which have been distorted, damaged or opened prior to installation are not acceptable.

1.5 STORAGE:

- A. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives, and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.6 QUALITY ASSURANCE:

- A. Installer Qualifications: A company specializing in installation with minimum three (3) years' experience and employs experienced flooring installers who have retained, and currently hold, an INSTALL Certification, or a certification from a comparable certification program.
 - 1. Installers to be certified by INSTALL or a comparable certification program with the following minimum criteria:
 - a. US Department of Labor approved four (4) year apprenticeship program, 160 hours a year.
 - b. Career long training.
 - c. Manufacturer endorsed training.
 - d. Fundamental journeyman skills certification.
- B. Furnish product type materials from the same production run.

1.7 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

1.8 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - D2047-11..... Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
 - D2240-05(R2010) Test Method for Rubber Property—Durometer Hardness
 - D4078-02(R2008) Water Emulsion Floor Finish
 - E648-14c..... Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source
 - E662-14..... Specific Optical Density of Smoke Generated by Solid Materials
 - E1155/E1155M-14 Determining Floor Flatness and Floor Levelness Numbers
 - F510/F510M-14..... Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method
 - F710-11 Preparing Concrete Floors to Receive Resilient Flooring
 - F925-13..... Test Method for Resistance to Chemicals of Resilient Flooring
 - F1344-12(R2013)..... Rubber Floor Tile
 - F1700-13a..... Solid Vinyl Floor Tile
 - F1869-11 Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - F2170-11 Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes
 - F2195-13..... Linoleum Floor Tile
- C. Code of Federal Regulation (CFR):

Resilient Tile Flooring

40 CFR 59Determination of Volatile Matter Content, Water Content, Density
Volume Solids, and Weight Solids of Surface Coating

- D. International Standards and Training Alliance (INSTALL):

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

- A. Provide adhesives, underlayment, primers, and polish recommended by resilient floor material manufacturer.
- B. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.
- C. Smoke Density: Less than 450 per ASTM E662.
- D. Slip Resistance – Not less than 0.5 when tested with ASTM D2047.

2.2 LUXURY VINYL TILE:

- A. ASTM F1700, Class III, Printed Film Vinyl Tile, Type B.
- B. Thickness: 3.2 mm (0.125 in.)
- C. Size: varies see Construction Documents.
- D. Provide products with recycled content with not less than 29 percent.
- E. Chemical Resistance: ASTM F925; pass.

2.3 ADHESIVES:

- A. Provide water resistant type adhesive for flooring, base and accessories as recommended by the manufacturer to suit substrate conditions. VOC content to be less than the 50 grams/L when calculated according to 40 CFR 59 (EPA Method 24). Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.4 PRIMER FOR CONCRETE SUBFLOORS:

- A. Provide in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.5 LEVELING COMPOUND FOR CONCRETE FLOORS:

- A. Provide cementitious products with latex or polyvinyl acetate resins in the mix in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.6 POLISH AND CLEANERS:

- A. Cleaners: As recommended in writing by floor tile manufacturer.
- B. Polish: ASTM D4078.

2.7 MOULDING:

- A. Provide tapered mouldings of clear anodized aluminum and types as indicated on the construction documents for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 6 mm (1/4 inch). Provide bevel change in level between 6 and 13 mm (1/4 and 1/2 inch) with a slope no greater than 1:2.
- B. Fasteners for Aluminum Mouldings: Stainless steel of type required for substrate condition.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS:

- A. Maintain flooring materials and areas to receive resilient flooring at a temperature above 20 degrees C (68 degrees F) for three (3) days before application, during application and two (2) days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 13 degrees C (55 degrees F) thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.
- B. Do not install flooring until building is permanently enclosed and wet construction in or near areas to receive tile materials is complete, dry and cured.

3.2 SUBFLOOR TESTING AND PREPARATION:

- A. Prepare and test surfaces to receive resilient tile and adhesive as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.
- B. Prepare concrete substrates in accordance with ASTM F710.

3.3 INSTALLATION:

- A. Install in accordance with manufacturer's instructions for application and installation unless specified otherwise.
- B. Mix tile from at least two containers. An apparent line either of shades or pattern variance is not acceptable.
- C. Tile Layout:
 - 1. If layout is not shown on construction documents, lay tile symmetrically about center of room or space with joints aligned.
 - 2. Vary edge width as necessary to maintain full size tiles in the field, no edge tile to be less than 1/2 the field tile size, except where irregular shaped rooms make it impossible.
 - 3. Place tile pattern in the same direction; do not alternate tiles unless specifically indicated in the construction documents to the contrary.
- D. Application:
 - 1. Adhere floor tile to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
 - 2. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
 - 3. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
 - 4. Roll tile floor with a minimum 45 kg (100 pound) roller.
- E. Seal joints at pipes with sealants in accordance with Section 07 92 00, JOINT SEALANTS.
- F. Installation of Edge Strips:
 - 1. Locate edge strips under center line of doors unless otherwise shown on construction documents.
 - 2. Set resilient edge strips in adhesive. Anchor metal edge strips with anchors and screws.
 - 3. Where tile edge is exposed, butt edge strip to touch along tile edge.
 - 4. Where thin set ceramic tile abuts resilient tile, set edge strip against floor file and against the ceramic tile edge.

3.4 CLEANING AND PROTECTION:

- A. Clean adhesive marks on exposed surfaces during the application of resilient materials before the adhesive sets. Exposed adhesive is not acceptable.

- B. Keep traffic off resilient material for a minimum 72 hours after installation.
- C. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and/or finish in accordance with manufacturer's written instructions.
- D. When construction traffic occurs over tile, cover resilient materials with reinforced kraft paper properly secured and maintained until removal is directed by COR. At entrances and where wheeled vehicles or carts are used, cover tile with plywood, hardboard, or particle board over paper, secured and maintained until removal is directed by COR.
- E. When protective materials are removed and immediately prior to acceptance, replace damaged tile and mouldings, re-clean resilient materials.

3.5 LOCATION:

- A. Unless otherwise indicated in construction documents, install tile flooring, under areas where casework, laboratory and pharmacy furniture and other equipment occur.
- B. Extend tile flooring for room into adjacent closets and alcoves.

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SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the construction documents and/or specified herein, including, but not limited to, the following:
1. Prime coats which may be applied in shop under other sections.
 2. Prime painting unprimed surfaces to be painted under this Section.
 3. Painting items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
 4. Painting ferrous metal (except stainless steel) exposed to view.
 5. Painting galvanized ferrous metals exposed to view.
 6. Painting interior concrete block exposed to view.
 7. Painting gypsum drywall exposed to view.
 8. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
 9. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
 10. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers lighting fixtures, and the like, which are exposed to view through these items.
 11. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.
 12. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
 13. Painting of any surface not specifically mentioned to be painted herein or on construction documents, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, is to be included as though specified.

1.2 RELATED WORK:

- A. Activity Hazard Analysis: Section 01 35 26, SAFETY REQUIREMENTS.
- B. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
- C. Masonry Repairs: Section 04 05 13, MASONRY MORTARING; Section 04 05 16, MASONRY GROUTING.
- D. Shop prime painting of steel and ferrous metals: Division 05 - METALS, Division 08 - OPENINGS; Division 10 - SPECIALTIES; Division 11 - EQUIPMENT; Division 12 - FURNISHINGS; Division 13 – SPECIAL CONSTRUCTION; Division 21 – FIRE SUPPRESSION; Division 22 - PLUMBING; Division 23 – HEATING; VENTILATION AND AIR-CONDITIONING; Division 26 - ELECTRICAL; Division 27 - COMMUNICATIONS; and Division 28 – ELECTRONIC SAFETY AND SECURITY sections.
- E. Prefinished flush doors with transparent finishes: Section 08 14 00, WOOD DOORS.
- F. Type of Finish, Color, and Gloss Level of Finish Coat: See Contract Documents.
- G. Asphalt and concrete pavement marking: Section 32 17 23, PAVEMENT MARKINGS.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Painter qualifications.
- D. Manufacturer's Literature and Data:
 - 1. Before work is started, or sample panels are prepared, submit manufacturer's literature and technical data, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one (1) list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.
- E. Sample Panels:
 - 1. After painters' materials have been approved and before work is started submit sample panels showing each type of finish and color specified.
 - 2. Panels to Show Color: Composition board, 100 x 250 mm (4 x 10 inch).
 - 3. Panel to Show Transparent Finishes: Wood of same species and grain pattern as wood approved for use, 100 x 250 mm (4 x 10 inch face) minimum, and where both flat and edge grain will be exposed, 250 mm (10 inches) long by sufficient size, 50 x 50 mm (2 x 2 inch) minimum or actual wood member to show complete finish.
 - 4. Attach labels to panel stating the following:
 - a. Federal Specification Number or manufacturers name and product number of paints used.
 - b. Specification code number specified in Construction documents.
 - c. Product type and color.
 - d. Name of project.
 - 5. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.
- F. Sample of identity markers if used.
- G. Manufacturers' Certificates indicating compliance with specified requirements:
 - 1. Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.
 - 2. High temperature aluminum paint.
 - 3. Epoxy coating.
 - 4. Plastic floor coating.

1.4 DELIVERY AND STORAGE:

- A. Deliver materials to site in manufacturer's sealed container marked to show following:
 - 1. Name of manufacturer.
 - 2. Product type.
 - 3. Batch number.
 - 4. Instructions for use.
 - 5. Safety precautions.
- B. In addition to manufacturer's label, provide a label legibly printed as following:
 - 1. Federal Specification Number, where applicable, and name of material.
 - 2. Surface upon which material is to be applied.
 - 3. Specify Coat Types: Prime; body; finish; etc.

- C. Maintain space for storage, and handling of painting materials and equipment in a ventilated, neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.
- D. Store materials at site at least 24 hours before using, at a temperature between 7 and 30 degrees C (45 and 85 degrees F).

1.5 QUALITY ASSURANCE:

- A. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces. Submit evidence that key personnel have successfully performed surface preparation and application of coating on a minimum of three (3) similar projects within the past three (3) years.
- B. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Contracting Officer Representative (COR) in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

1.6 REGULATORY REQUIREMENTS:

- A. Paint materials are to conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
 - 1. Volatile Organic Compounds (VOC) Emissions Requirements: Field-applied paints and coatings that are inside the waterproofing system to not exceed limits of authorities having jurisdiction.
 - 2. Lead-Based Paint:
 - a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
 - b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.
 - c. Do not use coatings having a lead content over 0.06 percent by weight of non-volatile content.
 - 3. Asbestos: Provide materials that do not contain asbestos.
 - 4. Chromate, Cadmium, Mercury, and Silica: Provide materials that do not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
 - 5. Human Carcinogens: Provide materials that do not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.
 - 6. Use high performance acrylic paints in place of alkyd paints.

1.7 SAFETY AND HEALTH

- A. Apply paint materials using safety methods and equipment in accordance with the following:
 - 1. Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis (AHA) as specified in Section 01 35 26, SAFETY REQUIREMENTS. The AHA is to include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.
- B. Safety Methods Used During Paint Application: Comply with the requirements of SSPC PA Guide 10.

- C. Toxic Materials: To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:
1. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.
 2. 29 CFR 1910.1000.
 3. ACHIH-BKLT and ACGHI-DOC, threshold limit values.

1.8 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.
- B. American Conference of Governmental Industrial Hygienists (ACGIH):
- ACGIH TLV-BKLT-2012..... Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)
 - ACGIH TLV-DOC-2012..... Documentation of Threshold Limit Values and Biological Exposure Indices, (Seventh Edition)
- C. ASME International (ASME):
- A13.1-07(R2013)..... Scheme for the Identification of Piping Systems
- D. Code of Federal Regulation (CFR):
- 40 CFR 59 Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating
- E. Commercial Item Description (CID):
- A-A-1272A..... Plaster Gypsum (Spackling Compound)
- F. Federal Specifications (Fed Spec):
- TT-P-1411A..... Paint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls) (CEP)
- G. Master Painters Institute (MPI):
- 1 Aluminum Paint
 - 4 Interior/ Exterior Latex Block Filler
 - 5 Exterior Alkyd Wood Primer
 - 7 Exterior Oil Wood Primer
 - 8 Exterior Alkyd, Flat MPI Gloss Level 1
 - 9 Exterior Alkyd Enamel MPI Gloss Level 6
 - 10 Exterior Latex, Flat
 - 11 Exterior Latex, Semi-Gloss
 - 18 Organic Zinc Rich Primer
 - 22 Aluminum Paint, High Heat (up to 590° - 1100°F)
 - 27 Exterior / Interior Alkyd Floor Enamel, Gloss
 - 31 Polyurethane, Moisture Cured, Clear Gloss
 - 36 Knot Sealer
 - 43 Interior Satin Latex, MPI Gloss Level 4
 - 44 Interior Low Sheen Latex, MPI Gloss Level 2
 - 45 Interior Primer Sealer
 - 46 Interior Enamel Undercoat

47	Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
48	Interior Alkyd, Gloss, MPI Gloss Level 6
50	Interior Latex Primer Sealer
51	Interior Alkyd, Eggshell, MPI Gloss Level 3
52	Interior Latex, MPI Gloss Level 3
53	Interior Latex, Flat, MPI Gloss Level 1
54	Interior Latex, Semi-Gloss, MPI Gloss Level 5
59	Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss
60	Interior/Exterior Latex Porch & Floor Paint, Low Gloss
66	Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved)
67	Interior Latex Fire Retardant, Top-Coat (ULC Approved)
68	Interior/ Exterior Latex Porch & Floor Paint, Gloss
71	Polyurethane, Moisture Cured, Clear, Flat
77	Epoxy Cold Cured, Gloss
79	Marine Alkyd Metal Primer
90	Interior Wood Stain, Semi-Transparent
91	Wood Filler Paste
94	Exterior Alkyd, Semi-Gloss
95	Fast Drying Metal Primer
98	High Build Epoxy Coating
101	Epoxy Anti-Corrosive Metal Primer
108	High Build Epoxy Coating, Low Gloss
114	Interior Latex, Gloss
119	Exterior Latex, High Gloss (acrylic)
134	Galvanized Water Based Primer
135	Non-Cementitious Galvanized Primer
138	Interior High Performance Latex, MPI Gloss Level 2
139	Interior High Performance Latex, MPI Gloss Level 3
140	Interior High Performance Latex, MPI Gloss Level 4
141	Interior High Performance Latex (SG) MPI Gloss Level 5
163	Exterior Water Based Semi-Gloss Light Industrial Coating, MPI Gloss Level 5

- H. Society for Protective Coatings (SSPC):
- SSPC SP 1-82(R2004) Solvent Cleaning
 - SSPC SP 2-82(R2004) Hand Tool Cleaning
 - SSPC SP 3-28(R2004) Power Tool Cleaning
 - SSPC SP 10/NACE No.2 Near-White Blast Cleaning

Painting

SSPC PA Guide 10Guide to Safety and Health Requirements

- I. Maple Flooring Manufacturer's Association (MFMA):
- J. U.S. National Archives and Records Administration (NARA):
29 CFR 1910.1000Air Contaminants
- K. Underwriter's Laboratory (UL)

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents.

2.2 PAINT PROPERTIES:

- A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.
- B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.
- C. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.
- D. VOC Content: For field applications that are inside the weatherproofing system, paints and coating to comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Non-flat Paints and Coatings: 150 g/L.
 - 3. Dry-Fog Coatings: 400 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
 - 5. Anticorrosive and Antirust Paints applied to Ferrous Metals: 250 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.
 - 8. Shellacs, Clear: 730 g/L.
 - 9. Shellacs, Pigmented: 550 g/L.
- E. VOC test method for paints and coatings is to be in accordance with 40 CFR 59 (EPA Method 24). Part 60, Appendix A with the exempt compounds' content determined by Method 303 (Determination of Exempt Compounds) in the South Coast Air Quality Management District's (SCAQMD) "Laboratory Methods of Analysis for Enforcement Samples" manual.

2.3 PLASTIC TAPE:

- A. Pigmented vinyl plastic film in colors as specified in Construction documents or as specified.
- B. Pressure sensitive adhesive back.
- C. Snap on coil plastic markers.
- D. Widths as shown on construction documents.

2.4 BIOBASED CONTENT

- A. Paint products shall comply with following bio-based standards for biobased materials:

Material Type	Percent by Weight
Interior Paint	20 percent biobased material
Interior Paint- Oil Based and Solvent Alkyd	67 percent biobased material

Exterior Paint	20 percent biobased material
Wood & Concrete Stain	39 percent biobased content
Polyurethane Coatings	25 percent biobased content
Water Tank Coatings	59 percent biobased content
Wood & Concrete Sealer- Membrane Concrete Sealers	11 percent biobased content
Wood & Concrete Sealer- Penetrating Liquid	percent biobased content

- B. The minimum-content standards are based on the weight (not the volume) of the material.

PART 3 - EXECUTION

3.1 JOB CONDITIONS:

- A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.
1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
 2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each day's work.
- B. Atmospheric and Surface Conditions:
1. Do not apply coating when air or substrate conditions are:
 - a. Less than 3 degrees C (5 degrees F) above dew point.
 - b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the COR and the product manufacturer. Under no circumstances are application conditions to exceed manufacturer recommendations.
 - c. When the relative humidity exceeds 85 percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
 2. Maintain interior temperatures until paint dries hard.
 3. Do no exterior painting when it is windy and dusty.
 4. Do not paint in direct sunlight or on surfaces that the sun will warm.
 5. Apply only on clean, dry and frost free surfaces except as follows:
 - a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces only when allowed by manufacturer's printed instructions.
 - b. Concrete and masonry when permitted by manufacturer's recommendations, dampen surfaces to which water thinned acrylic and cementitious paints are applied with a fine mist of water on hot dry days to prevent excessive suction and to cool surface.
 6. Varnishing:
 - a. Apply in clean areas and in still air.
 - b. Before varnishing vacuum and dust area.
 - c. Immediately before varnishing wipe down surfaces with a tack rag.

3.2 INSPECTION:

- A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.3 GENERAL WORKMANSHIP REQUIREMENTS:

- A. Application may be by brush or roller. Spray application only upon acceptance from the COR in writing.
- B. Furnish to the COR a painting schedule indicating when the respective coats of paint for the various areas and surfaces will be completed. This schedule is to be kept current as the job progresses.
- C. Protect work at all times. Protect all adjacent work and materials by suitable covering or other method during progress of work. Upon completion of the work, remove all paint and varnish spots from floors, glass and other surfaces. Remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and leave work in a clean condition.
- D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.
- E. When indicated to be painted, remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.
- F. Materials are to be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.
- G. Apply materials with a coverage to hide substrate completely. When color, stain, dirt or undercoats show through final coat of paint, the surface is to be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Government.
- H. All coats are to be dry to manufacturer's recommendations before applying succeeding coats.
- I. All suction spots or "hot spots" in plaster after the application of the first coat are to be touched up before applying the second coat.
- J. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.4 SURFACE PREPARATION:

- A. General:
 - 1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished are to be completely dry, clean and smooth.
 - 2. See other sections of specifications for specified surface conditions and prime coat.
 - 3. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
 - 4. Clean surfaces before applying paint or surface treatments with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
 - 5. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Fiber-Cement Board: 12 percent.
 - c. Masonry (Clay and CMU's): 12 percent.
 - d. Wood: 15 percent.
 - e. Gypsum Board: 12 percent.

f. Plaster: 12 percent.

B. Wood:

1. Sand to a smooth even surface and then dust off.
2. Sand surfaces showing raised grain smooth between each coat.
3. Wipe surface with a tack rag prior to applying finish.
4. Surface painted with an opaque finish:
 - a. Coat knots, sap and pitch streaks with MPI 36 (Knot Sealer) before applying paint.
 - b. Apply two coats of MPI 36 (Knot Sealer) over large knots.
5. After application of prime or first coat of stain, fill cracks, nail and screw holes, depressions and similar defects with wood filler paste. Sand the surface to make smooth and finish flush with adjacent surface.
6. Before applying finish coat, reapply wood filler paste if required, and sand surface to remove surface blemishes. Finish flush with adjacent surfaces.
7. Fill open grained wood such as oak, walnut, ash and mahogany with MPI 91 (Wood Filler Paste), colored to match wood color.
 - a. Thin filler in accordance with manufacturer's instructions for application.
 - b. Remove excess filler, wipe as clean as possible, dry, and sand as specified.

C. Ferrous Metals:

1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning). Where high temperature aluminum paint is used, prepare surface in accordance with paint manufacturer's instructions.
3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.
 - a. Fill flat head countersunk screws used for permanent anchors.
 - b. Do not fill screws of item intended for removal such as glazing beads.
4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.

D. Zinc-Coated (Galvanized) Metal, Aluminum, Surfaces Specified Painted:

1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with MPI 18 (Organic Zinc Rich Coating). Prime or spot prime with MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non-Cementitious Galvanized Primer) depending on finish coat compatibility.

E. Gypsum Plaster and Gypsum Board:

1. Remove efflorescence, loose and chalking plaster or finishing materials.
2. Remove dust, dirt, and other deterrents to paint adhesion.
3. Fill holes, cracks, and other depressions with CID-A-A-1272A finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.5 PAINT PREPARATION:

- A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.

- B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.
- C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.
- D. Mix two (2) component and two (2) part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.
- E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.6 APPLICATION:

- A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.
- B. Unless otherwise specified, apply paint in three (3) coats; prime, body, and finish. When two (2) coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.
- C. Apply each coat evenly and cover substrate completely.
- D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by COR.
- E. Apply by brush or roller. Spray application for new or existing occupied spaces only upon approval by acceptance from COR in writing.
 - 1. Apply painting materials specifically required by manufacturer to be applied by spraying.
 - 2. In new construction and in existing occupied spaces, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in "Building and Structural Work Field Painting"; "Work not Painted"; motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.
- F. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

3.7 PRIME PAINTING:

- A. After surface preparation, prime surfaces before application of body and finish coats, except as otherwise specified.
- B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.
- C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.
- D. Prime rabbets for stop and face glazing of wood, and for face glazing of steel.
- E. Wood and Wood Particleboard:
 - 1. Use same kind of primer specified for exposed face surface.
 - a. Exterior wood: MPI 7 (Exterior Oil Wood Primer) for new construction and MPI 5 (Exterior Alkyd Wood Primer) for repainting bare wood primer except where MPI 90 (Interior Wood Stain, Semi-Transparent) is scheduled.
 - b. Interior wood except for transparent finish: MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat), thinned if recommended by manufacturer.
 - c. Transparent finishes as specified under "Transparent Finishes on Wood Except Floors Article".
 - 2. Apply two (2) coats of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel

Painting

- Undercoat) to surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reason.
3. Apply one (1) coat of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) as soon as delivered to site to surfaces of unfinished woodwork, except concealed surfaces of shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish.
 4. Back prime and seal ends of exterior woodwork, and edges of exterior plywood specified to be finished.
 5. Apply MPI 67 (Interior Latex Fire Retardant, Top-Coat (UL Approved) to wood for fire retardant finish.
- F. Metals except boilers, incinerator stacks, and engine exhaust pipes:
1. Steel and iron: Use MPI 101 (Cold Curing Epoxy Primer) where or MPI 98 (High Build Epoxy Coating) or MPI 108 (High Build Epoxy Marine Coating finish is specified.
 2. Zinc-coated steel and iron: MPI 134 (Waterborne Galvanized Primer) .
 3. Aluminum scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
 4. Terne Metal: MPI 79 (Marine Alkyd Metal Primer) or MPI 95 (Fast Drying Metal Primer) .
 5. Copper and copper alloys scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
 6. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel).
 7. Asphalt coated metal: MPI 1 (Aluminum Paint).
 8. Metal over 94 degrees C (201 degrees F), Boilers, Incinerator Stacks, and Engine Exhaust Pipes: MPI 22 (High Heat Resistant Coating).
- G. Gypsum Board:
1. Surfaces scheduled to have MPI 52 (Interior Latex, MPI Gloss Level 3) .
 2. Primer: MPI 50 (Interior Latex Primer Sealer)
 3. Surfaces scheduled to receive vinyl coated fabric wall covering: MPI 50 (Interior Latex Primer Sealer)
- H. Concrete Floors: MPI 99 (Water-based Acrylic Curing and Sealing Compound).
- 3.8 EXTERIOR FINISHES:**
- A. Apply following finish coats where specified in See Construction documents.
- B. Wood:
1. Do not apply finish coats on surfaces concealed after installation, top and bottom edges of wood doors and sash, or on edges of wood framed insect screens.
 2. Two (2) coats of MPI 119 (Exterior Latex, High Gloss (acrylic) on exposed surfaces, except where transparent finish is specified.
- C. Steel and Ferrous Metal:
1. Two (2) coats of MPI 9 (Exterior Alkyd Enamel) on exposed surfaces, except on surfaces over 94 degrees C (201 degrees F).
- D. Machinery without factory finish except for primer: One (1) coat MPI 9 (Exterior Alkyd Enamel) .
- 3.9 INTERIOR FINISHES:**
- A. Apply following finish coats over prime coats in spaces or on surfaces specified in See Construction documents.
- B. Metal Work:
1. Apply to exposed surfaces.
 2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
 3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
 - a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) unless specified otherwise.

- b. Two (2) coats of MPI 48 (Interior Alkyd Gloss).
 - c. One (1) coat of MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss) on exposed interior surfaces of alkyd-amine enamel prime finished windows.
 - d. One (1) coat of MPI 101 primer over two (2) coats of waterborne light industrial coating MPI 163 on exposed surfaces in battery rooms . Steel is to be blast cleaned to SSPC 10/NACE No. 2.
 - e. Machinery: One (1) coat MPI 9 (Exterior Alkyd Enamel).
 - f. Asphalt Coated Metal: One (1) coat MPI 1 (Aluminum Paint).
 - g. Ferrous Metal over 94 degrees K (290 degrees F): Boilers, Incinerator Stacks, and Engine Exhaust Pipes: One (1) coat MPI 22 (High Heat Resistant Coating).
- C. Gypsum Board:
- 1. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3).
 - 2. Two (2) coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2).
 - 3. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) or MPI 114 (Interior Latex, Gloss).
 - 4. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 48 (Interior Alkyd Gloss).
- D. Wood:
- 1. Sanding:
 - a. Use 220-grit sandpaper.
 - b. Sand sealers and varnish between coats.
 - c. Sand enough to scarify surface to assure good adhesion of subsequent coats, to level roughly applied sealer and varnish, and to knock off "whiskers" of any raised grain as well as dust particles.
 - 2. Sealers:
 - a. MPI 31 (gloss) or MPI 71 (flat) thinned as recommended by manufacturer at rate of one (1) part of thinner to four (4) parts of varnish.
 - b. Apply sealers specified except sealer may be omitted where pigmented, penetrating, or wiping stains containing resins are used.
 - c. Allow manufacturer's recommended drying time before sanding, but not less than 24 hours or 36 hours in damp or muggy weather.
 - d. Sand as specified.
 - 3. Transparent Finishes on Wood Except Floors.
 - a. Natural Finish:
 - 1) One (1) coat of sealer MPI 31 (gloss) thinned with thinner recommended by manufacturer at rate of one (1) part of thinner to four (4) parts of varnish.
 - 2) Two (2) coats of MPI 71 (Polyurethane, Moisture Cured, Clear Flat).
 - b. Stain Finish:
 - 1) One (1) coat of MPI 90 (Interior Wood Stain, Semi-Transparent).
 - 2) Use wood stain of type and color required to achieve finish specified. Do not use varnish type stains.
 - 3) One (1) coat of sealer MPI 31 (gloss) thinned as recommended by manufacturer at rate of one (1) part of thinner to four (4) parts of varnish.
 - 4) Two (2) coats of MPI 71 (Polyurethane, Moisture Cured, Clear Flat).
 - c. Varnish Finish:
 - 1) One (1) coat of sealer MPI 31 (gloss) thinned as recommended by manufacturer at rate of one (1) part of thinner to four (4) parts of varnish.
 - 2) Two (2) coats of MPI 71 (Polyurethane, Moisture Cured, Clear Flat).
 - d. Fire Retardant Intumescent Varnish:
 - 1) MPI 66 (Interior Alkyd Fire Retardant, Clear Top-Coat (UL Approved)) Intumescent Type, Fire Retardant Coating where scheduled: Two (2) coats.

- E. See Construction documents for finishes. Concrete Floors: One (1) coat of MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss).
- F. Miscellaneous:
 - 1. Apply where specified in See Construction documents.
 - 2. MPI 1 (Aluminum Paint): Two (2) coats of aluminum paint.
 - 3. Existing acoustical units scheduled to be repainted except acoustical units with a vinyl finish:
 - a. Clean units free of dust, dirt, grease, and other deterrents to paint adhesion.
 - b. Mineral fiber units: One (1) coat of MPI 52 (Interior Latex, MPI Gloss Level 3) .
 - c. Units of organic fiber or other material not having a class A rating: One (1) coat of MPI 66 (Interior Alkyd Fire Retardant, Clear Top-Coat (UL Approved) fire retardant paint.
 - 4. Interstitial floor markings: One (1) coat MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss) .

3.10 PAINT COLOR:

- A. Color and gloss of finish coats is specified in Construction documents.
- B. For additional requirements regarding color see Articles, "REFINISHING EXISTING PAINTED SURFACE" and "MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE".
- C. Coat Colors:
 - 1. Color of priming coat: Lighter than body coat.
 - 2. Color of body coat: Lighter than finish coat.
 - 3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.
- D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:
 - 1. Paint to match color of casework where casework has a paint finish.
 - 2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.11 MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE:

- A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.
- B. In spaces not scheduled to be finish painted in Construction documents paint as specified below.
- C. Paint various systems specified in Division 02 – EXISTING CONDITIONS, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY.
- D. Paint after tests have been completed.
- E. Omit prime coat from factory prime-coated items.
- F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.
- G. Omit field painting of items specified in "BUILDING AND STRUCTURAL WORK FIELD PAINTING"; "Building and Structural Work not Painted".
- H. Color:

1. Paint items having no color specified in Construction documents to match surrounding surfaces.
2. Paint colors as specified in Construction documents except for following:
 - a. White: Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.
 - b. Gray: Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
 - c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).
 - d. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conduits containing fire alarm control wiring, and fire alarm equipment.
 - e. Federal Safety Orange: Entire lengths of electrical conduits containing feeders 600 volts or more.
 - f. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.
- I. Apply paint systems on properly prepared and primed surface as follows:
 1. Exterior Locations:
 - a. Apply two (2) coats of MPI 8 (Exterior Alkyd, Flat) to the following ferrous metal items:
 - 1) Vent and exhaust pipes with temperatures under 94 degrees C(201 degrees F), roof drains, fire hydrants, post indicators, yard hydrants, exposed piping and similar items.
 - b. Apply two (2) coats of MPI 10 (Exterior Latex, Flat) or MPI 11 (Exterior Latex, Semi-Gloss) or MPI 119 (Exterior Latex, High Gloss (acrylic) to galvanized and zinc-copper alloy metal.
 - c. Apply one (1) coat of MPI 22 (High Heat Resistant Coating), 650 degrees C (1200 degrees F) to incinerator stacks, boiler stacks, and engine generator exhaust.
 2. Interior Locations:
 - a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) to following items:
 - 1) Metal under 94 degrees C (201 degrees F) of items such as bare piping, fittings, hangers and supports.
 - 2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.
 - 3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.
 - b. Apply one (1) coat of MPI 50 (Interior Latex Primer Sealer) and one (1) coat of MPI 43 (Interior Satin Latex) on finish of insulation on boiler breeching and uptakes inside boiler house, drums, drumheads, oil heaters, feed water heaters, tanks and piping.
 - c. Apply two (2) coats of MPI 22 (High Heat Resistant Coating) to ferrous metal surface over 94 degrees K (290 degrees F) of following items:
 - 1) Steam line flanges, bare pipe, fittings, valves, hangers and supports over 94 degrees K (290 degrees F).
 - d. Paint electrical conduits containing cables rated 600 volts or more using two (2) coats of MPI 9 (Exterior Alkyd Enamel) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.
 3. Other exposed locations:
 - a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two (2) coats of MPI 1 (Aluminum Paint).

- b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One (1) coat of MPI 50 (Interior Latex Primer Sealer) and one (1) coat of MPI 10 (Exterior Latex, Flat).

3.12 BUILDING AND STRUCTURAL WORK FIELD PAINTING:

- A. Painting and finishing of interior and exterior work except as specified here-in-after.
 - 1. Painting and finishing of new work including colors and gloss of finish selected is specified in Finish Schedule, See Construction documents.
 - 2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
 - 3. Painting of ferrous metal and galvanized metal.
 - 4. Painting of wood with fire retardant paint exposed in attics, when used as mechanical equipment space (except shingles).
 - 5. Identity painting and safety painting.
- B. Building and Structural Work not Painted:
 - 1. Prefinished items:
 - a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
 - b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
 - 2. Finished surfaces:
 - a. Hardware except ferrous metal.
 - b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
 - c. Signs, fixtures, and other similar items integrally finished.
 - 3. Concealed surfaces:
 - a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
 - b. Inside walls or other spaces behind access doors or panels.
 - c. Surfaces concealed behind permanently installed casework and equipment.
 - 4. Moving and operating parts:
 - a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
 - b. Tracks for overhead or coiling doors, shutters, and grilles.
 - 5. Labels:
 - a. Code required label, such as Underwriters Laboratories Inc., Intertek Testing Service or Factory Mutual Research Corporation.
 - b. Identification plates, instruction plates, performance rating, and nomenclature.
 - 6. Galvanized metal:
 - a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
 - b. Gas Storage Racks.
 - c. Except where specifically specified to be painted.
 - 7. Metal safety treads and nosings.
 - 8. Gaskets.
 - 9. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundations walls and interior walls in pipe basements.
 - 10. Face brick.
 - 11. Structural steel encased in concrete, masonry, or other enclosure.
 - 12. Structural steel to receive sprayed-on fire proofing.
 - 13. Ceilings, walls, columns in interstitial spaces.
 - 14. Ceilings, walls, and columns in pipe basements.
 - 15. Wood Shingles.

3.13 IDENTITY PAINTING SCHEDULE:

- A. Identify designated service in new buildings or projects with extensive remodeling in accordance with ASME A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels. For existing spaces where work is minor match existing.
- Legend may be identified using snap-on coil plastic markers or by paint stencil applications.
 - Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12.2 M (40 feet) apart on straight runs of piping. Identification next to plumbing fixtures is not required.
 - Locate Legends clearly visible from operating position.
 - Use arrow to indicate direction of flow using black stencil paint.
 - Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on construction documents where asterisk appears for High, Medium, and Low Pressure designations as follows:
 - High Pressure - 414 kPa (60 psig) and above.
 - Medium Pressure - 104 to 413 kPa (15 to 59 psig).
 - Low Pressure - 103 kPa (14 psig) and below.
 - Add Fuel oil grade numbers.
 - Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Blow-off		Green	White	Blow-off
Boiler Feedwater		Green	White	Blr Feed
A/C Condenser Water Supply		Green	White	A/C Cond Wtr Sup
A/C Condenser Water Return		Green	White	A/C Cond Wtr Ret
Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Shop Compressed Air		Blue	White	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower
High Pressure Steam		Green	White	H.P. _____*
High Pressure Condensate Return		Green	White	H.P. Ret _____*
Medium Pressure Steam		Green	White	M. P. Stm _____*
Medium Pressure Condensate Return		Green	White	M.P. Ret _____*
Low Pressure Steam		Green	White	L.P. Stm _____*
Low Pressure Condensate Return		Green	White	L.P. Ret _____*
High Temperature Water Supply		Green	White	H. Temp Wtr Sup
High Temperature Water		Green	White	H. Temp Wtr Ret

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PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Return				
Hot Water Heating Supply		Green	White	H. W. Htg Sup
Hot Water Heating Return		Green	White	H. W. Htg Ret
Gravity Condensate Return		Green	White	Gravity Cond Ret
Pumped Condensate Return		Green	White	Pumped Cond Ret
Vacuum Condensate Return		Green	White	Vac Cond Ret
(Diesel Fuel included under Fuel Oil)				
Boiler Water Sampling		Green	White	Sample
Chemical Feed		Green	White	Chem Feed
Continuous Blow-Down		Green	White	Cont. B D
Pumped Condensate		Green	White	Pump Cond
Pump Recirculating		Green	White	Pump-Recirc.
Vent Line		Green	White	Vent
Alkali		Orange	Black	Alk
Bleach		Orange	Black	Bleach
Detergent		Yellow	Black	Det
Liquid Supply		Yellow	Black	Liq Sup
Reuse Water		Yellow	Black	Reuse Wtr
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water	Green	White	RG	
Reverse Osmosis	Green	White	RO	
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Chemical Resistant Pipe				
Waste		Orange	Black	Acid Waste
Vent		Orange	Black	Acid Vent
Atmospheric Vent		Green	White	ATV

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Silver Recovery		Green	White	Silver Rec
Oral Evacuation		Green	White	Oral Evac
Fuel Gas		Yellow	Black	Gas
Fire Protection Water				
Sprinkler	Red	Red	White	Auto Spr
Standpipe	Red	Red	White	Stand
Sprinkler	Red	Red	White	Drain
Hot Water Supply Dom.				
Solar Water		Green	White	H.W. Sup Dom/SW
Hot Water Return Dom.				
Solar Water		Green	White	H.W. Ret Dom/SW

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6096 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, 5000 or 15000 or 25000.
8. See Sections for methods of identification, legends, and abbreviations of the following:
 - a. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS / Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS / Section 28 05 28.33, CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY..

- B. Fire and Smoke Partitions:
 1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
 2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
 3. Locate not more than 6096 mm (20 feet) on center on corridor sides of partitions, and with a least one (1) message per room on room side of partition.
 4. Use semi-gloss paint of color that contrasts with color of substrate.
- C. Identify columns in pipe basements and interstitial space:
 1. Apply stenciled number and letters to correspond with grid numbering and lettering indicated on construction documents.
 2. Paint numbers and letters 101 mm (4 inches) high, locate 45 mm (18 inches) below overhead structural slab.
 3. Apply on four (4) sides of interior columns and on inside face only of exterior wall columns.
 4. Color:
 - a. Use black on concrete columns.
 - b. Use white or contrasting color on steel columns.

3.14 PROTECTION CLEAN UP, AND TOUCH-UP:

- A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.
- B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.

- C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

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Painting

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