ADDENDUM

UNT/ UNTS
OAK STREET HALL DEMOLITION &
ART STUDIO FACILITY
1001 W. MULBERRY STREET
DENTON, TEXAS 76201
VAI Project No. 18012.001

December 4, 2020

ADDENDUM NO. 04
Addendum to Project Manual and Drawings dated November 09, 2020

NOTICE TO BIDDERS:

PROJECT MANUAL
A. ADD Section 313116 Termite Control dated 12/07/2020
B. DELETE Section 072101 Spray Foam Insulation dated 13 January 2015. It does not relate to this project.
C. REPLACE Section 074113 Metal Roof Panels dated 09 November 2020 with Section 074113 Metal Roof Panels dated 07 December 2020.
D. ADD Section 074456 Fiber Cementitious Panels dated 07 December 2020.

DRAWINGS
A. REPLACE Sheet A-611 Door schedule, door & frame types, louver types, misc. details dated November 09, 2020 with Sheet A-611 Door schedule, door & frame types, louver types, misc. details dated December 07, 2020. Door widths for doors 101B and 101C modified from 3'-0" to 4'-0".

RESPONSE TO BIDDER’S QUESTIONS:

1. Reference PEMB as indicated on sheets ALT A-111D, ALT A-112, and ALT A-302. PEMB supplier needs a spec / thickness, on the standing seam roofing. Also need a color / finish for the roofing. If you refer back to the structural it calls for 22 Gauge Galvanized, which they’re certain they won’t be able to get standing seam in 22 Ga.

RESPONSE: Reference specification section 133419 Metal Building Systems for information.
2. The underground Natural Gas piping on the exterior of the building is shown on both the civil and plumbing drawings. Is the Owner providing gas to the building? If not please provide a list of Atmos approved contractors.
   **RESPONSE:** Owner is not providing gas to the building. It is in the scope of this contract. Contact Atmos for approved contractors.

3. The incoming gas is not sized on P-110D or on the civil drawings, therefore it is impossible to quote the correct piping required.
   **RESPONSE:** Gas line is distributed from an existing 4” line at Welch and Hickory to building meter location.

4. There is no apparent piping connection diagram for the 3” piping shown on P-111D to the 1-1/2” piping shown on P-111D.
   **RESPONSE:** A simple 3” tee and then a reducer to 1-1/2” pipe. Apply similar reducer connections, ‘y’, ‘Tee’, etc. when not noted.

5. There are no floor drains under the Emergency Showers; one OSHA mandated drench of an injured person will put 300 gallons of water on the floor, REFERENCE: OSHA 29 CFR 1910.151(c)
   **RESPONSE:** Per Appendix B UNT design and construction standards, Appendix B of the project manual floor drains are not allowed at safety showers. Floor drains are not required at the safety shower locations.

6. On P-111B there are unsized pipes running to Emergency Eye/Showers (note 6). According to OSHA Guidelines; ANZI Z352.1-2014, the showers must drench the injured person with 20 gal per minute, at 30 PSI, for 15 minutes, which will require at least a 1-1/4” Cold and Hot Water supply. Therefore the 1” water line supplying it and the S-1 downstream is of insufficient size.
   **RESPONSE:** Incoming ¾” c and h blends thru mixer and either 1” – 1-1/4” single pipe to shower.

7. The Plumbing Fixture Schedule & Riser Diagrams all have ¾” running to each EMSH. See link: https://www.bradleycorp.com/mediamanager/view/11783/S19314FSS_S19314BFSS_Combi_Drench_Showerr_and_Halo_All_SS_Eye-Face_Wash.pdf
   **RESPONSE:** Incoming ¾” c and h blends thru mixer and either 1” – 1-1/4” single pipe to shower.

8. The above issues bring me to question the sizing of a lot of the piping in this design, perhaps they might be addressed in an addendum.
   **RESPONSE:** Reference riser diagrams for piping sizes at specific locations.

9. The schedule refers to S-2 w/ #LK940AT08LH, wall mounted, 2.2 GPM Dual Lever Swing Spout Faucet, etc. There is no water piping run to these fixtures for us to figure out how many drops to make to each sink. Is it the engineer’s intent that there be two faucets per sink or one?
   **RESPONSE:** Reference riser diagrams for piping sizes at specific locations.

10. Specification 051200 section 2.E.2 specifies the coating of all exterior exposed structural steel with a high build epoxy primer which requires a commercial grit blast (SSPC-SP6) to clean and profile the steel surface. It is impossible to grit blast and thoroughly coat all of the surfaces of steel bar joists.
    We are requesting an option to hot dip galvanize all exposed steel in lieu of grit blasting and prime painting.
   **RESPONSE:** Response provided in Addendum 03 regarding project manual specification sections for structural framing and joist painting. Structure (columns, beams, angles, etc) and joists (separate section) can be shopped primed/epoxy primed as specified. Exterior exposed structure to be painted not galvanized.
11. The narrative of the alternate indicates that it involves the high mast lighting replacement at Lot 55.

On drawing E-101 (assuming this is base bid) they are indicating that the lighting is replaced. On this same drawing they indicate that the primary power is underground from connection point to pad mount transformer.

**RESPONSE:** Drawing E-101 makes no reference to removing and replacing the high mast light. Pole Lighting indicated is pedestrian lighting. Reference to removing and replacing the high mast light is only made on ALT AS-101

On drawing Alt E-101 it is again indicated to change out all the high mast lighting. But on Alt E-101 the primary power is shown as partial underground and partial overhead.

**RESPONSE:** Drawing ALT E-101 makes no reference to removing and replacing the high mast light. Pole Lighting indicated is pedestrian lighting. Reference to removing and replacing the high mast light is only made on ALT AS-101

The differences between the two drawings have to do with the primary power installation routing and not the high mast lighting as the narrative suggests.

In addition C8 Franchise Conduit Plan shows both primary power and fiber optic conduits routing underground through Lot 55 matching the routing on E-101. The scope of work on Alt E-101 moves the primary to an overhead installation but does not address the fiber optic lines.

**RESPONSE:** Routing of fiber optics would become direct buried if alternate for electrical service to overhead is accepted.

12. Is the new Fire Alarm panel at the Art Studio to be tied into the Campus Onyx Works system?

**RESPONSE:** Yes, reference Appendix B UNT University Design and Construction Standards page 99 (approximate PDF page 268) of project manual.

13. Reference section 051200 paragraph 2.E.2: specifies the coating of all exterior exposed structural steel with a high build epoxy primer which requires a commercial grit blast (SSPC-SP6) to clean and profile the steel surface. It is impossible to grit blast and thoroughly coat all surfaces of steel bar joists. We are requesting an option to hot dip galvanize all exposed steel in lieu of grit blasting and prime painting. Please confirm.

**RESPONSE:** Reference Addendum 03 Response to Bidders’ Questions and above item 10.

14. Reference sheet A-201: Elevation 01 shows the location of three storefront windows that relate to Alternate #10. A width is shown but not a height. Please provide detailed elevations for these windows including width and height dimensions as well as head, sill and jamb sections.

**RESPONSE:** Reference Addendum 03 Response to Bidder’s Questions.

15. Specifications

   a. Termite Treatment is not listed on the Table of Contents; please provide specifications if is this scope required.

**RESPONSE:** Termite Specification provided in Addendum 04.

   b. Utilities is listed on the Table of Contents but no specification is included; please provide specifications.

**RESPONSE:** Utility specification section “Not Used”, information provided on Civil drawings.
16. Plans
   a. Sheet Q-111A – Q-111D, Equipment Schedule is not completed to indicate which items are furnished and installed by the Owner, Vendor or Contractor; please provide a completed schedule.
   RESPONSE: Q-111A-Q-111D revised. Sheets provided in Addendum 04.

17. The design of the hot water recirculating system is over 20’ from the EEWS on P-111C; that will not supply the tempered water required for drench purposes by OSHA; the first blast will be cold for several seconds and is not allowed.
   RESPONSE: Ambient temperature of piping inside conditioned space will not be below the listed 60 degree minimum required.
   “The water temperature should be set to a comfortable range, around 85 degrees F (27 degrees C). OSHA regulations, by referencing ANSI standards, recommend the water be above 60 degrees F (16 degrees C) to avoid hypothermia and below 100 degrees F (38 degrees C) to minimize harm to the eyes and soft tissues.”

18. In Drawing AVS402, the racks in AV Closets 144, 141, and 123 are each illustrated to contain one (1) WPD, one (1) OFE laptop, and one (1) DOC Camera. However, it appears that these items should actually be located in the associated classroom with the projector. Please clarify the location of the aforementioned items.
   RESPONSE: The WPD does reside in the FRK within the respective A/V closets, as does the OFE Computer, STPTX switcher/transmitter and the MIX/AMP audio mixer. The OFE Laptop and DOC camera reside on the worktop surface provided within the respective A/V closets.

19. On Drawing AVI151, in Hand Building CLRM Room 105, there is a marker for a keyed note 2. However, a keyed note 2 does not appear in the keyed notes legend on the drawing. Please clarify the meaning of keyed note 2 on drawing AVI151.
   RESPONSE: There is no accompanying information for keyed note #2. Please disregard.

20. Equipment Schedule does not denote responsibility – Owner Furnished Owner Installed items. Please clarify.
   RESPONSE: Q sheets revised and provided in Addendum 04.

21. Drawing C7 shows a 6” sewer line connecting to an Oil Sand Interceptor. However corresponding Drawing P110C calls for a 4” line. Please advise which is correct.
   RESPONSE: 4” is a minimum, 4” connection on basin, civil providing 6” on out fall

22. Electrical Drawings do not show power and circuit information for Oil Sand Interceptor/Alarm. Please clarify.
   RESPONSE: A 120V source will be provided from the nearest available circuit.

23. Drawing P110D note 1 and 7 do not appear to correspond to the linework. Please clarify.
   RESPONSE: Modify drawings to be note 7 at note 1 location. Note 1 to be at the northeast corner gas meter location, between piping indicated at notes 10 and 11.

24. Drawing P110D calls for a 1” CW line, while corresponding Drawing C7 calls for a 1.5” domestic water line. Please clarify which sizing is correct.
   RESPONSE: 1” water indicated on sheet from P110d is valid. The routing indicated on civil would require second backflow preventor which is not in MEP design scope.
25. Drawing P110B shows a 1 ½” gas line that upsizes and changes to a 3” line at Roof. Please confirm this is coordinated with Atmos.
   **Response:** This is not coordinated with Atmos.

26. Please see Details 2 and 3 on T401, should we consider conduit to be installed by Division 26 to extend from cable tray to outlet, or should j-hooks be employed for cables exiting the cable tray through a stubbed-out conduit?
   **RESPONSE:** J-Hooks shall be used from the tray to outlets in areas where ceiling is not open. In areas of open ceiling conduit shall be run to the nearest cable tray.

27. Regarding TS101, what is the type and strand count of the required fiber optic cable(s) and pair count of copper backbone cable, if required? Are Backbone cables to be spliced to existing cable in a handhole outside Matthews Hall? Please clarify.
   **RESPONSE:** Based on Riser Diagram on T001 a 96 strand SM fiber shall be run directly from Mathews Hall to ASF.

28. The incoming gas is not sized on P-110D or on the civil drawings, also, the underground Natural Gas piping on the exterior of the building is shown on both the civil and plumbing drawings; whose scope should it be in?
   **RESPONSE:** Gas line is distributed from an existing 4” line at Welch and Hickory to building meter location. For bidding purposes underground natural gas piping to be civil scope to and from meter connections to regulator at main building.

29. **Rack Item Location**
   In Drawing AVS402, the racks in AV Closets 144, 141, and 123 are each illustrated to contain one (1) WPD, one (1) OFE laptop, and one (1) DOC Camera. However, it appears that these items should actually be located in the associated classroom with the projector. Please clarify the location of the aforementioned items.
   **RESPONSE:** The WPD does reside in the FRK within the respective A/V closets, as does the OFE Computer, STPTX switcher/transmitter and the MIX/AMP audio mixer. The OFE Laptop and DOC camera reside on the worktop surface provided within the respective A/V closets.

30. **Keyed Note**
   On Drawing AVI151, in Hand Building CLRM Room 105, there is a marker for a keyed note 2. However, a keyed note 2 does not appear in the keyed notes legend on the drawing. Please clarify the meaning of keyed note 2 on drawing AVI151.
   **RESPONSE:** There is no accompanying information for keyed note #2. Please disregard.

31. **Projector OFE Equipment**
   Detail 3 of drawing AVI401 illustrate the projector and mounts as being OFE equipment. However, specification sections 274116 and 274113 indicate that these are to be provided by the AV contractor. Please clarify who is to furnish and install the projectors and mounts.
   **RESPONSE:** The projector mount assembly mounted to structure above, illustrated by keyed notes 1 through 4, is to be provided by the GC/EC. Items 5 through 8 are to be provided by the AV Contractor/Integrator.

32. **Infrastructure Equipment Breakdown**
   Audiovisual Infrastructure Devices Schedule” on drawing AVI001 notes that “Audiovisual infrastructure devices are provided and installed by electrical contractor unless otherwise noted”. Please confirm that the AV contractor is only to provide the AV infrastructure devices mentioned in sub-section 2.2 of specification section 274113.
**RESPONSE:** All AV infrastructure (e.g. power, communications data, back boxes, conduit pathways, pull strings and other conveyances) are to be provided by the GC/Others. The AV Contractor is only responsible for those items listed in sub-section 2.2 of specification section 274113 and the systems listed in specification section 274116.

**33. Power Management Rack Mountable**
In Drawing AVS402 the AV closet equipment rack elevation shows the PWR device as rack mounted. However, the APC SMT1500C Power management device is not rack mountable. Please clarify PWR location.
**RESPONSE:** This is the UNT standard power conditioner. Place the device in the bottom of the rack as indicated on sheet AVS402 detail #2 and secure its location with a 5-gang blank plate and security screws.

**34.** I don’t think I framed my question correctly relating to the 25 Integrated Automation Standards - Appendix E of the UNT Guidelines.
The Appendix E that is currently being used in this project has been updated by UNT to allow both Schneider and Automated Logic by Logical Solutions as the only (2) acceptable BMS providers for UNT. Can the updated design guidelines be referenced for this project to allow Logical Solutions to provide a BMS solution for this project?
**RESPONSE:** UNT accepts Automated Logic by Logical Solutions as a provider for BMS.

**35.** Please clarify the extent of the glass film scope - there are specifications but no mention of glass film in drawings. If required, please provide the desired design or an allowance to be included for the film.
**RESPONSE:** No scope for glass film.

**36.** Please provide spec sections for Division 33 – Utilities
**RESPONSE:** Utility specification section “Not Used”, information provided on Civil drawings.

**37.** Please clarify the required floor finish at Kiln Yard 150, Clay Mixing Room 151, & Blaauw Rm 152
**RESPONSE:** Broom finished. No sealer.

**38.** Please clarify how many of each pier is required - drawings show numerous piers that are not notated as to which type is required.
**RESPONSE:** All piers appear to be noted. Reference pier information in boxes that note “TYP. U.N.O.”

**39.** Please confirm whether unit prices for drilled piers will be required. Specifications indicated two (2) separate unit costs are to be provided, however there is not a location for this information on the bid form. Please clarify how this is to be addressed.
**RESPONSE:** At bottom of proposal form add the following and provide unit pricing:
- “Unit price per linear foot for piers longer than base lengths:
- Unit price per linear foot for piers shorter than base lengths:
- Unit price per linear foot of casing used:”

**40.** The underground natural gas piping at the exterior of the building is shown on both the civil & plumbing drawings, & it is unclear where the civil sub is to stop and the plumber is to continue the piping. Please clarify.
**RESPONSE:** Gas line is distributed from an existing 4” line at Welch and Hickory to building meter location. For bidding purposes underground natural gas piping to be civil scope to and from meter connections to regulator at main building.
41. Please provide a scaled pathway drawing showing manholes or other buildings that need to be accessed for the fiber pull on Sheet T001, Note #8 for the 96 strand single mode from the Matthews Hall MDF.

**RESPONSE:** Refer to available map imagery available online for the location of Matthews Hall. Pathway follows established streets (South down Welch, West Highland St to Matthews Hall).

42. Please provide the fiber type, number of strands, & termination details on both ends for Sheet OS TSD101, Note #1.

**RESPONSE:** Cable is currently a Hybrid 24SM and 24MM. Once the cable is pulled into the Annex from the pole on the corner of W. Oak St. and Ponder Ave. only the SM fiber will be terminated.

43. Water & Sewer Plan C7, General Note 5 states that sewer pipe shall be PVC ASTM 3034 - SDR35. Plan C7.1, Sanitary Sewer Profile SS-1 shows 6" PVC SDR26. Please clarify which is correct for this application - SDR35 or SDR26.

**RESPONSE:** SDR26

44. Div 22 – Plumbing-Please confirm/verify current CW & HW piping serving these fixtures.

**RESPONSE:** No fixtures noted but reference the plumbing diagrams for piping information.

45. Specifications – 13.34.19 Metal Building – This section is noted as “not used” on the Table of Contents and not included in the specifications; Alternate #7 requires a pre-engineered metal building; please provide a specification/basis of design/design criteria.

**RESPONSE:** Specification section is included. Ignore note “not used” in the table of contents.

46. Specifications – 05 xx xx Metal Panels – Alternate #2 as noted on AS-101 requires perforated metal panels, posts, accessories; please provide a specification.

**RESPONSE:** Specification not provided. Design Equipment enclosure. 4’-0” x 10’-0” panels. Manufacturer Pac-Clad or similar.

47. Specifications – 09 xx xx Fiber Cement Panels and Rainscreen – Alternate #4 as noted on AS-101 requires fiber cement panels and a rainscreen system; please provide a specification.

**RESPONSE:** Specification included in Addendum 04

48. Geotechnical Report – is a Pier Casing and Pier Drilling Extra Depth Allowance required? Please clarify an amount, if any, to be included in the bid.

**RESPONSE:** At bottom of proposal form add the following and provide unit pricing:

- "Unit price per linear foot for piers longer than base lengths:"
- "Unit price per linear foot for piers shorter than base lengths:"
- "Unit price per linear foot of casing used:"

49. Plans – ALT-xxx Sheets/Alternates – courtesy heads-up that the Alternates listed on the ALT Sheets do not match those listed in Spec Section 012300 Alternates (#7, #8, #9 are missing)

**RESPONSE:** Alternate information is not missing. Alternate 7 is noted on A-111D and sheets are noted in alternate specification section, 8 sheets are noted in alternate specification section; 9 sheet is noted in alternate specification section.

50. Plans – ALT E-101, Spec Section 0123000 Alternates – is Alternate #9 scope for electrical service only or does it also include “fiber” scope mentioned in the scope description; please clarify Alternate #9 scope.

**RESPONSE:** Fiber becomes direct buried if alternate is accepted.
51. Plans – OS, C1.1 – please provide a depth for bidding purposes of the existing underground storm and sanitary sewer piping to be removed.

RESPONSE: Depth of storm and sanitary sewer is not available.

52. Plans – C7/Water and Sewer Plan – the 6’ fireline does not show a DDCV in a vault; please confirm the backflow is to be on the fire riser.

RESPONSE: Provide for back flow preventer in the fire riser room.

END OF ADDENDUM NO. 04
SECTION 313116
TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Provisions established within General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SECTION INCLUDES
A. Soil treatment below structural slabs and at foundation perimeter for subterranean insects

1.3 QUALITY ASSURANCE
A. Applicator: Company specializing in soil treatment for termite control with 10 years documented experience.
B. Materials: Provide certification that toxicants conform to specified requirements.
C. Material Packaging: Manufacturer's labels and seals identifying content.

1.4 REGULATORY REQUIREMENTS
A. Conform to applicable requirements of authorities having jurisdiction for application licensing and authority to use toxicant chemicals.

1.5 SUBMITTALS
A. Submit product data and manufacturer's installation instruction under provisions of Section 013300.
B. Indicate toxicants to be used, composition by percentage, dilution schedule, and intended application rate.

1.6 WARRANTY
A. Provide 5 year warranty for material and installation under provisions of Section 017800.
B. Warranty: Cover against invasion or propagation of subterranean termites, damage to building or building contents caused by termites, and repairs to building or building contents so caused.
C. Inspect work annually and report in writing to Owner.
D. Owner reserves right to renew warranty for an additional 5 years after the initial 5 year period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturers and Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Termicides:
   a. Aventis Environmental Science USA LP; Termidor
   b. Bayer Corporation; Premise 75
   c. Dow AgroSciences LLC; Equity
   d. FMC Corporation, Agricultural Products Group; Dragnet SFR
   e. Syngenta; Altriset
B. Substitutions: Submit in accordance with Section 016000.
2.2 **SOIL TREATMENT**  
A. **Termiticide:** Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

2.3 **MIX DILUTION**  
A. Dilute toxicant chemical as recommended by manufacturer.

**PART 3 - EXECUTION**

3.1 **INSPECTION/PREPARATION**  
A. Verify the soil surfaces are unfrozen, sufficiently dry to absorb toxicant, ready to receive treatment.  
B. Beginning of application means acceptance of soil conditions.

3.2 **APPLICATION**  
A. **General:** Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for EPA-Registered Label for products preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.  
B. Verify the soil surfaces are unfrozen, sufficiently dry to absorb toxicant, ready to receive treatment.  
C. Beginning of application means acceptance of soil conditions.  
D. **Apply toxicant no more than 12 hours prior to installation of vapor barrier under mud slabs, structural slabs, slab-on-grade or finish grading outside foundation walls.**  
E. Apply toxicant in accordance with manufacturer's instructions.  
F. **Apply extra treatment to structure penetrations, pipe, ducts, expansion joints, and other soil penetrations.**  
G. Apply as a coarse spray to ensure uniform distribution.  
H. Coordinate soil treatment at foundation perimeter with finish grading and landscaping work to avoid disturbance of treated soil. **Retreat disturbed treated soil.**  
I. Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations. To insure penetration, do not apply soil treatment to excessively wet soils or during inclement weather.  
J. Post signs in the areas of application, warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

3.3 **RETREATMENT**  
A. If inspection identifies the presence of termites, retreat soil and retest.  
B. Use same toxicant as for original treatment.

**END OF SECTION**
PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Standing-seam metal roof panels including flashings and accessories

1.3 DEFINITIONS
A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.
B. See ASTM D 1079 and glossary of NRCA'S “The NRCA Roofing and Waterproofing Manual” for definition of terms related to metal roofing work in this Section.
C. Roofing System Manufacturer: Any of the manufactures whose systems are specified under “Acceptable Roofing System Manufacturers”, herein called “manufacturer”.

1.4 PERFORMANCE REQUIREMENTS
A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
B. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft.of roof area when tested according to ASTM E 1680 at the following test-pressure difference:
   1. Test-Pressure Difference: Negative 1.57 lbf/sq. ft.
   2. Test-Pressure Difference: Positive and negative 1.57 lbf/sq. ft.
   3. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
   4. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.
D. Water Penetration: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
   1. Test-Pressure Difference: 20 percent of positive design wind pressure, but not less than 6.24 lbf/sq. ft.
   2. Positive Preload Test-Pressure Difference: Greater than or equal to 15.0 lbf/sq. ft. and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference.
   3. Negative Preload Test-Pressure Difference: 50 percent of design wind-uplift-pressure difference.
E. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
F. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 90.
G. FMG Listing: Provide metal roof panels and component materials that comply with requirements in FMG 4471 as part of a panel roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
   1. Fire/Windstorm Classification: Class 1A-90.
   2. Hail Resistance: SH.
H. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592-95:
   1. Design Wind Loads: As indicated on structural drawings or as otherwise determined using design wind loads applicable to Project from basic wind speed indicated in miles per hour, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure.”
2. **Deflection Limits:** Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than L/240 of the span.

I. **Thermal Movements:** Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. **Temperature Change (Range):** 120 deg F, ambient; 180 deg F, material surfaces.

J. **Thermal Performance:** Provide insulated metal roof panel assemblies with thermal-resistance value (R-value) indicated when tested according to ASTM C 518.

K. **Energy Performance:** Provide roof panels with solar reflectance index not less than 29 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

L. **Energy Performance:** Provide roof panels that are listed on the U.S. Department of Energy's ENERGY STAR Roof Products Qualified Product List for steep-slope roof products.

1.5 **SUBMITTALS**

A. **Product Data:** For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.

B. **Shop Drawings:** Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. **Accessories:** Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

a. Flashing and trim.

C. **Samples for Initial Selection:** For each type of metal roof panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. **Delegated-Design Submittal:** For metal roof panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. [Snow Retention System Calculations: Include calculation of number and location of snow guards based on snow load, roof slope, panel length and finish, and seam type and spacing.]

E. **Manufacturer Certificates:** Signed by manufacturer certifying that roof panels comply with energy performance requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

F. **Qualification Data:** For qualified Installer.

G. **Field quality-control reports.**

H. **Warranties:** Samples of special warranties.

1.6 **QUALITY ASSURANCE**

A. **Installer Qualifications:** An employer of workers trained and approved by manufacturer.

B. **Testing Agency Qualifications:** Qualified according to ASTM E 329 for testing indicated.

C. **Source Limitations:** Obtain each type of metal roof panels from single source from single manufacturer.

D. **Fire-Resistance Ratings:** Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL’s "Fire Resistance Directory" or from the listings of another qualified testing agency.

2. **Combustion Characteristics:** ASTM E 136.

1.7 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.

B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.
1.8 PROJECT CONDITIONS
A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.
B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.9 COORDINATION
A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks, purlins and rafters, parapets, walls, and other adjoining work to provide a leak-proof, secure, and non-corrosive installation.

1.10 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      c. Insert failure modes.
   2. Warranty Period: Two years from date of Substantial Completion.
B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.
C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
   1. Weathertight Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS
A. Metallic-Coated Steel Sheet: 24 gauge (min.) G-90 (ASTM-A525) Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   1. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil 0.013 mm.
      a. Color: As selected by Architect from manufacturer's full range.
B. Panel Sealants:
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, non-toxic, non-staining tape 1/2 inch wide and 1/8 inch thick.
   2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
2.2 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
   3. Products: Subject to compliance with requirements, [provide one of the following]
      a. Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.
      c. Henry Company; Blueskin PE200 HT.

2.3 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653, G90 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.
B. Hat-Shaped, Rigid Furring Channels:
   1. Nominal Thickness: As required to meet performance requirements.
   2. Depth: 7/8 inch.
C. Cold-Rolled Furring Channels: Minimum 1/2-inch wide flange.
   1. Nominal Thickness: As required to meet performance requirements.
   2. Depth: 3/4 inch.
   3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
   4. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch diameter wire.
D. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, and depth required to fit insulation thickness indicated.
   1. Nominal Thickness: As required to meet performance requirements.
E. Stainless Steel Fasteners for Miscellaneous Metal Framing: Of type, size, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.4 MISCELLANEOUS MATERIALS

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

2.5 MECHANICALLY SEAMED, CONCEALED ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
   1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
B. Mechanically Seamed, Concealed Fastener, Trapezoidal Seam Metal Roof Panels: Structural metal roof panel consisting of formed metal sheet with raised trapezoidal ribs at panel edges, installed by lapping and mechanically interconnecting edges of adjacent panels, and attaching panels to supports using concealed clips and fasteners in a weathertight installation.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
      a. Berridge
      b. MBCI; a division of NCI Building Systems, L. P.
      c. Architectural Building Components Houston, Texas
      d. Petersen Aluminum Corporation.
   2. Basis of Design: Equal to MBCI Double Lock panels, Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50, pre-painted by the coil-coating process per ASTM A 755/A 755M.
   3. Clips: Floating to accommodate thermal movement.
4. Panel Coverage: **18 inches**.
5. Panel Height: **3.0 inch**.
6. **Color**: As selected from manufacturers standard colors.

### 2.6 ACCESSORIES

A. **Roof Panel Accessories**: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fascias, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
   1. **Closures**: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
   2. **Closure Strips**: Closed-cell, expanded, cellular, rubber or cross-linked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or pre-molded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
   3. **Backings Plates**: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

B. **Flashings and Trim**: Formed from same material as roof panels, pre-painted with coil coating, minimum 0.018 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fascias, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

### 2.7 FABRICATION

A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather tight and minimize noise from movements within panel assembly.

D. **Sheet Metal Accessories**: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. **End Seams for Aluminum**: Fabricate non-moving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
   3. **End Seams for Other Than Aluminum**: Fabricate non-moving seams with flat-lock seams. Tin edges to be sealed, form seams, and solder.
   4. **Sealed Joints**: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
   5. **Conceal fasteners and expansion provisions where possible**: Exposed fasteners are not allowed on faces of accessories exposed to view.
   6. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

### 2.8 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. **Appearance of Finished Work**: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
B. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.

C. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

D. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.

E. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

B. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.
   1. Soffit Framing: Clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 UNDERLAYMENT INSTALLATION
A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
   1. Install beneath entire roof surface.

B. Install flashings to cover underlayment to comply with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim."

3.4 METAL ROOF PANEL INSTALLATION, GENERAL
A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.
   1. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.

C. Install metal roof panels as follows:
   1. Commence metal roof panel installation and install minimum of 300 sq. ft.in presence of factory-authorized representative.
   2. Field cutting of metal panels by torch is not permitted.
   3. Install panels perpendicular to purlins.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Provide metal closures at [rake edges] [rake walls] [and] each side of ridge[ and hip] caps.
   6. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
   7. Install ridge [and hip] caps as metal roof panel work proceeds.
   8. End Splices: Locate panel end splices over, but not attached to, structural supports. Stagger panel end splices to avoid a four-panel splice condition.
   9. Install metal flashing to allow moisture to run over and off metal roof panels.

D. Fasteners:
   1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and stainless-steel fasteners for surfaces exposed to the interior.
   2. Aluminum Roof Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or stainless-steel fasteners for surfaces exposed to the interior.
   3. Copper Roof Panels: Use copper, stainless-steel, or hardware-bronze fasteners.

E. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt
underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.

G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.

2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to supports with self-tapping fasteners.

2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

3.6 METAL SOFFIT PANEL INSTALLATION

A. In addition to complying with requirements in "Metal Roof Panel Installation, General" Article, install metal soffit panels to comply with requirements in this article.

B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.

1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

C. Metal Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.7 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.8 ERECTION TOLERANCES

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

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.

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

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

END OF SECTION
SECTION 07 44 56
MINERAL-FIBER-REINFORCED
CEMENTITIOUS PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Fiber cement panels of the following types:
   1. Through color high density fiber cement panels: Patina

1.2 RELATED SECTIONS
A. Section 05 40 00 - Cold-Formed Metal Framing.
B. Section 06 01 10 - Rough Carpentry.
C. Section 07 27 26 – Fluid Applied Air Barriers.

1.3 REFERENCES
A. ASTM - ASTM International:
   1. ASTM E 84 - Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS
A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Shop Drawings: Provide detailed drawings of non-standard applications of fiber cement materials which are outside the scope of the standard details and specifications provided by the manufacturer.
D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
B. Color Evaluation: Insignificant change after 3000 hours of QUV test (EN 20105).
C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Remodel mock-up area as required to produce acceptable work.

1.6 FABRICATION, DELIVERY, STORAGE, AND HANDLING
A. All cladding materials to be finished and fabricated in the United States with backup inventory in residence in the United States to support job in-progress.
B. Store products in manufacturer's unopened packaging until ready for installation in accordance with manufacturer's recommended guidelines.
1.7 PROJECT CONDITIONS
A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer’s recommended limits.

1.8 WARRANTY
A. Warranty: Manufacturer warrants that its products are manufactured in accordance with its applicable material specifications and are free from defects in materials and workmanship.
   1. Only products that are installed and used in accordance with applicable manufacturer’s instructions and specifications are warranted.
   2. The warranty is applicable only to claims made in writing and received by the manufacturer within thirty days after the defect was discovered and within ten years after the date of the shipment of the product by the manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURER/SUPPLIER
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cladding Fiber Cement Panels
   2. JamesHardie – Hardie Panel smooth

B. Basis of Design: AFC Cladding Fiber Cement Panels by American Fiber Cement Corp.; Tel: (303) 978-1199. Fax: (303) 978-0308.

C. Substitutions: In accordance with Division 01 requirements.

2.2 THROUGH COLOR HIGH DENSITY FIBER CEMENT PANELS
A. Through Color High Density Fiber Cement Panels:
   1. Product:
      b. Thickness: 5/16 inch (8 mm).
      c. Finish: Through-colored, muted, matte finish with a unique weather-proof treatment which makes it resistant to staining and surface dirt.
      e. Physical Characteristics: EN 12467 ' Fiber-cement flat sheets'.
         1) Density Dry: 1500 kg/m3.
         2) Bending strength at with grain: 32.0 MPa.
         3) Bending strength at across grain: 22.0 MPa.
         4) Modulus of elasticity at with grain: greater than 16 GPa.
         5) Modulus of elasticity at across grain: greater than 14 GPa.
         6) Hygric movement wet-dry-wet (max), mean: 2.60 mm/m.
         7) Durability classification (EN 12467): Category A.
         8) Strength classification (EN 12467): Class 4.
         9) Fire reaction (EN 13501-1): A2-s1-d0.
         10) Warm water test: Ok.
         11) Soak dry test: Ok.
         12) Freeze thaw test: greater than 100 cycles.
         13) Thermal conductivity e: 0.4 W/mK.
      f. Fire Testing:
         1) ASTM E84.
         2) ASTM E136.

PART 3 EXECUTION

3.1 EXAMINATION
A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION
A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION
A. Install in accordance with manufacturer's instructions and approved submittals.
B. For exterior applications, comply with local codes and structural engineer's fastening calculations along with manufacturer's recommendations for fastener spacing.

3.4 EXTERIOR CLADDING FOR RAINSCREEN APPLICATIONS
A. Detailing Requirements:
   1. Air space at top and bottom of building or wall termination shall be 3/4 inch (20 mm) to facilitate airflow from behind the panels. Do not block vertical airflow at windows, doors, eaves, or at the base of the building. Airflow shall be continuous from bottom to top so there is air movement behind each panel. For walls over 60 feet high (18 m), the ventilated cavity between rear of panels and exterior wall shall be increased to 1-5/8 inches (40 mm). Airflow behind the cement fiber panels is critical to the performance of the rain screen constructions.
   2. Fasteners in profile shall accommodate thermal expansion/contraction of metal and not interfere with panel application.
   3. Install panels from top of building to bottom.
   4. For straight walls, start panel installation in center and work outward.
   5. For walls with inside corners, start installation at corner and work across wall.
B. Rain Screen Installation: Comply with manufacturer's installation requirements.
   1. Attachment System: Comply with manufacturer's engineered design for cladding support framing.

3.5 PROTECTION
A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION