

eFacade PRO+

BIPV Cladding with Aluminum
Honeycomb Backing

Cladishield Rainscreen System

Middle East Standards

MITREX Spec Note: This master specification is written to include SPEC NOTES noted as “MITREX Spec Note” in order to assist designers in their decision-making process. SPEC NOTES precede the text to which they apply. This section should serve as a guideline only and should be edited by a knowledgeable person to meet the requirements of each specific project.

Text indicated in bold and by square brackets is optional. Make appropriate decisions and delete the optional text as well as the brackets in the final copy of the specification. Delete or hide the SPEC NOTES in the final version of the document.

This specification section is written to follow the recommendations of the Construction Specifications Institute/Construction Specifications Canada (CSI/CSC) such as MasterFormat™, SectionFormat™, and PageFormat™. It is also written with metric and imperial units of measurement.

MITREX manufactures and sells building envelope materials. MITREX does not practice architecture or engineering. Therefore, the design responsibility remains with the architect, engineer, or Architect. We hope the information given here will of some assistance. It is based upon data considered to be true and accurate and is offered solely for the user's consideration, investigation and verification. Nothing contained herein is representative of a warranty or guarantee for which MITREX can be held legally responsible. MITREX does not assume any responsibility for any misinterpretation or assumptions the reader may formulate.

This Specification specifies the following **BUILDING-INTEGRATED PV CLADDING PANELS**

PART 1 – GENERAL

1.1 SUMMARY

1. Provide labour, materials, products, equipment and services to complete the PV cladding panels work specified herein. This includes, but is not necessarily limited, to:
 1. Building-integrated PV cladding assemblies
 2. Auxiliary materials required for complete installation.

1.2 RELATED REQUIREMENTS

1. Specifications throughout all Divisions of the Project shall be read as a whole and may be directly applicable to this Section.
2. Related requirements provided below are for convenience purposes only.

MITREX Spec Note: Limit section listings to only those sections containing specific information that would directly affect the work of this section. Do not include Division 01 sections in this listing.

1. Section 05 41 00, Structural Metal Stud Framing: for secondary support framing supporting metal wall panels.
2. Section 07 21 00, Insulation: for provision of thermal insulation.
3. Section 07 27 00, Air Barriers: for provision of air barrier assemblies.
4. Section 07 62 00, Sheet Metal Flashing and Trim: for miscellaneous copings, flashings and other sheet metal work not part of work of this Section.
5. Section 07 92 00, Joint Sealants: for field-applied sealants not otherwise specified in this Section.
6. Division 26 – Electrical: For facility's electrical infrastructure.

1.3 REFERENCES

1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
2. All reference amendments adopted prior to the Bid Closing date of this Project shall be applicable to this Project.
3. All materials, installation and workmanship shall comply with all applicable requirements and standards.

MITREX Spec Note: Verify list of reference standards below and edit to suit standards listed in the Section after edits have been performed.

4. ASTM International (ASTM)
 1. ASTM B117: Standard Practice for Operating Salt Spray (Fog) Apparatus
 2. ASTM B221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 3. ASTM C271: Standard Test Method for Density of Sandwich Core Materials
 4. ASTM C273/C273M: Standard Test Method for Shear Properties of Sandwich Core Materials
 5. ASTM C297/C297M: Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
 6. ASTM C364/C364M: Standard Test Method for Edgewise Compressive Strength of Sandwich Constructions
 7. ASTM C365: Standard Test Method for Flatwise Compressive Properties of Sandwich Cores
 8. ASTM C393/C393M: Standard Test Method for Core Shear Properties of Sandwich Constructions by Beam Flexure
 9. ASTM C480/C480M: Standard Test Method for Flexure Creep of Sandwich Constructions
 10. ASTM C481: Standard Test Method for Laboratory Aging of Sandwich Constructions

11. ASTM C666/C666M: Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
 12. ASTM C754: Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
 13. ASTM C880/C880M: Standard Test Method for Flexural Strength of Dimension Stone
 14. ASTM C897: Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters
 15. ASTM C920: Standard Specification for Elastomeric Joint Sealants
 16. ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood
 17. ASTM D7766/D7766M: Standard Practice for Damage Resistance Testing of Sandwich Constructions
 18. ASTM E84: Standard Test Method for Surface Burning Characteristics Of Building Materials
 19. ASTM E136: Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C
 20. ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 21. ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
 22. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 23. ASTM E772: Standard Terminology of Solar Energy Conversion
 24. ASTM E1886: Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
 25. ASTM E1996: Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
 26. ASTM G154: Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
5. International Organization for Standardization (ISO)
 1. ISO 10545: Ceramic tiles - Part 13: Determination of chemical resistance
 6. National Fire Protection Association (NFPA)
 1. NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, 2019 Edition

2. NFPA 70: National Electrical Code (NEC)
7. Underwriters Laboratories (UL)
 1. UL 61215: Standard for Crystalline Silicon Terrestrial Photovoltaic PV Modules – Design Qualification and Type Approval
 2. UL 61730-1: Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction
 3. UL 61730-2: Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing
8. European Norm (EN)
 1. BS EN 13501-1-2018: Classification of Reaction to Fire Performance
9. International Electrotechnical Commission (IEC)
 1. IEC 61701: Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
 2. IEC 60068-2-68: Environmental Testing: Dust and Sand
 3. IEC 62716: Ammonia Corrosion Testing of Photovoltaic (PV) Modules
 4. IEC 62804-1: Photovoltaic (PV) Modules – Test Methods for the Detection of Potential-Induced Degradation (PID)

1.4 DEFINITIONS

1. Electrical and Electronics Terminology: Unless otherwise specified, electrical and electronics terminology used herein shall be as defined by IEEE 100 CD.
2. Solar Energy Conversion and Solar Photovoltaic Energy System Terminology: Unless otherwise specified, solar energy conversion and solar photovoltaic energy system terminology used herein shall be as defined by ASTM E772.
3. Abbreviations and Acronyms
 1. EVA: Ethylene-Vinyl Acetate
 2. MSVD: Magnetic Sputter Vacuum Deposition
 3. PV: Photovoltaic

1.5 ADMINISTRATIVE REQUIREMENTS

1. Preinstallation Meeting: Conduct Meeting at Project site.

MITREX Spec Note: Retain subparagraphs below if additional requirements are necessary; revise to include more specific information about Meeting.

1. Meet with Owner, Architect, Subcontractor, manufacturer's representative, structural-support Subcontractor, and Subcontractors whose work interfaces with or affects faced cladding

panels, including Installers of doors, windows, and louvers. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

2. Review flashings, special panels details, wall penetrations, openings, and condition of other construction that affect faced cladding panels.
 3. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
 4. Review temporary protection requirements for faced cladding panels during and after installation.
 5. Review procedures for repair of panels damaged after installation.
 6. Document proceedings, including corrective measures and actions required, and Supply copy of record to each participant.
 7. Agenda: review progress of other construction activities and preparations for the particular activity under consideration.
 8. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
2. Scheduling: Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Sequencing: Sequence work to permit installation of materials in conjunction with related materials and seals.

1.6 ACTION SUBMITTALS

1. Product Data:
 1. Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.
 2. Submit material manufacturer's Product Data, instructions for temperature and other limitations of installation conditions, technical data supplied by the manufacturer.
2. [Sustainable Design Submittals:
 1. **Environmental Product Declarations (EPD): submit Type III EPD conforming to ISO 14025 or other recognized environmental product declaration framework.]**
 3. Shop Drawings: Submit for faced cladding panel assemblies' work. Include plans, elevations, sections, full-size details, anchorage, locations of accessory items and attachments to other work. Include fabrication and installation layouts of faced Cladding panel assemblies; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
 1. Accessories: Include details of the flashing, trim and anchorage. Indicate field measurements on Shop Drawings.

2. Include diagrams for power, and wiring.
4. Delegated-Design Submittals: Submit engineered and stamped shop drawings for faced cladding panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
5. Initial Selection Samples: Submit for each type of faced cladding panel component requiring finish selection.
 1. Include representative Samples of available finishes and graphics.
6. Verification Samples: Upon initial selection of samples, submit verification samples for each type of faced cladding panel showing each component and with the required finishes as follows:
 1. Submit a 7 inch by 14-inch (178 mm by 356 mm) sample of each type of PV cladding panel illustrating typical exterior panel assembly, including typical junction box and associated wiring.

1.7 INFORMATIONAL SUBMITTALS

7. Warranties: Submit sample of extended warranties specified in this Section for Architect's review.
8. Quality Assurance Submittals:
 1. Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
 2. Product Test Reports: Submit copies of product test reports carried out by a qualified testing agency for each product report specified in this Section,

1.8 CLOSEOUT SUBMITTALS

1. Maintenance Data: Submit operation and maintenance data for each type of faced cladding panel assembly to include in maintenance manuals.

1.9 QUALITY ASSURANCE

MITREX Spec Note: MITREX installation must be performed by a trained and authorized MITREX Installer. Contact info@Mitrex.com for the authorized MITREX Installer near you.

1. Installer Qualifications: Installation must be performed by an Installer who has been trained or otherwise authorized by the manufacturer.
2. Manufacturer Qualifications: Provide Products from a manufacturer with a minimum of 10 years of experience and capable of providing cladding panel assemblies that meet or exceed performance requirements indicated.
3. Mock-ups: Build mock-ups to verify selections made under Sample submittals and to demonstrate esthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical faced cladding panel assembly including corner, supports, attachments, and accessories.
2. Approval of mockups does not represent approval of deviations from Contract Documents, unless Architect approves such deviations in writing.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.
4. Source Limitations for panels: Obtain primary components of faced cladding panel assemblies, from a single manufacturer. Obtain secondary components and accessories from sources acceptable to manufacturers of primary materials.

1.10 DELIVERY, STORAGE AND HANDLING

1. General: Deliver, store and handle materials and products in strict compliance with
2. manufacturer's instructions and recommendations. Inspect components for damage upon delivery.
3. Storage: Store products in a secure enclosed area protected from the elements, in manufacturer's packaging until ready for installation.
4. Handling: Handle materials with care and avoid dents, scratches, or damage to products. Remove labels, stickers or protection after installation.

1.11 PROJECT CONDITIONS

1. Field Measurements: Verify actual panel locations by field measurements performed by the Installer prior to commencement of fabrication. Ensure recorded measurements provided by the Installer are indicated on Shop Drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
2. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of faced cladding panels to be performed according to manufacturers' written instructions and warranty requirements.

1.12 COORDINATION

1. Coordinate faced cladding panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.13 WARRANTY

1. Special Warranty: Provide manufacturer's standard warranty which covers Products specified in this Section that fail in materials or workmanship within specified warranty period.

MITREX Spec Note: Edit paragraph below to reflect warranty required for the project.

1. Warranty Period - Materials:

1. Panel performance: 25 years from date of Substantial Completion.
2. Solar photovoltaic cells: 25 years from date of Substantial Completion.
3. Power output: 25 years manufacturer's power output warranty, at 80% minimum rated power output of the initial nominal power by year 25.
4. Delamination: lifetime of Products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Materials specified in this Section are based on Products as supplied by Mitrex Inc.; 41 Racine Road, Toronto, ON M9W 2Z4; T: 416-497-7120; E: info@mitrex.com; web: www.mitrex.com

MITREX Spec Note: Retain one of the two options below to either permit or preclude other manufacturers from bidding on the Work of this Section.

2. **[Substitution Limitations: No further substitutions are acceptable.]**
3. **[Substitution Limitations: Conforming to requirements of Section 01 25 00, Substitution Procedures and as follows:**
 1. **Architect will consider requests for substitution if received [10] days before Bid Closing Deadline. Requests received after that time will be rejected. Architect will consider requests for substitution when following conditions are satisfied:**
 1. **Requests for substitution include a list of at least five similar projects of equivalent size where products have been installed for a minimum of five years.**
 2. **Requested substitution does not require extensive revisions to the Contract Documents.**
 3. **Requested substitution is consistent with the Contract Documents and will produce indicated results.**
 4. **Requested substitution will not adversely affect construction schedule.**
 5. **Requested substitution provides specified warranty.]**

2.2 DESIGN AND PERFORMANCE REQUIREMENTS

MITREX Spec Note: Specify the regulation(s) that is (are) applicable to the Project.

1. Professional Engineer's Design and Certification: Employ the services of a Professional Engineer licensed to practice in the jurisdiction of the Project and who is experienced in providing engineering

services of similar kind, scope and complexity; to design and certify building-integrated PV cladding panels.

2. Provide panels with the following physical characteristics:

1. Salt Spray Resistance: No deleterious effects after 1000 Hours of exposure in accordance with ASTM B117
2. Density of Sandwich Core: Not less than 20.42 lb/ft³(327 kg/m³) for 12 inch x 12 inch x 0.6 inch (305 mm x 305 mm x 15 mm) when tested in accordance with ASTM C271/C271M.
3. Laboratory Aging of Sandwich Construction:
 1. Based on Procedure A per ASTM C481 for six repetitions of following load cycle:
 1. Immerse in water at 122 deg F (50 deg C) for 1 hour
 2. Spray with steam at 203 deg F (95 deg C) for 3 hours
 3. Store at 10 deg F (-12 deg C) for 20 hours
 4. Heat at 212 deg F (100 deg C) for 3 hours
 5. Spray with steam at 203 deg F (95 deg C) for 3 hours
 6. Heat in dry air at 212 deg F (100 deg C) for 18 hours
 2. Results: ASTM C273; ASTM C297; ASTM C364; ASTM C393 tests were reconducted after aging; variation as follows: +1.36 %, -5.90%; +2.55%; -7.95% (Positive variation indicates no decrease in strength after aging)
4. Linear Thermal Expansion: 11.28×10^{-6} per deg F when tested from room temperature to 212 deg F (100 deg C) in accordance with ISO 10545.
5. Fluorescent Ultraviolet Radiation Exposure: No visible change to facing or adhesive after 2000 hours of UV exposure when tested in accordance with ASTM G154.
6. Rapid Freeze-Thaw Cycling Resistance: No visible change to facing or adhesive after 200 cycles of rapid freeze and thaw ranging from 39 deg F (4 deg C) to -0.4 deg F (-18 deg C) when tested in accordance with ASTM C666/C666M.
7. Uniform Static Pressure/Deflection under loading: Provide faced cladding panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E330:
 1. Maximum permanent deflection of 0.004 inch (0.10 mm) at 5.76 kPa (positive) and -5.006 kPa (negative) based on static pressure and uniform static deflection testing.
 2. Deflection Limits: Maximum deflection as follows under 3.84 kPa (80.2 psf) positive and negative loadings:
 1. Positive pressure: 0.163 inch (4.14 mm)
 2. Negative pressure: 0.194 inch (4.93 mm)
 3. Ensure stress on panel skin does not exceed manufacturer's recommended maximum value to avoid permanent deformation.
8. Shear Stress and Shear Modulus: Ultimate Core strength of not less than 147 psi (1.01 MPa) and core shear modulus of not less than 1,583 psi (10.9 MPa) based on testing per ASTM C273/C273M (Compressive force applied until rupture)

9. Flatwise Tensile Bond Strength: Not less than 220 psi (1.52 MPa) when tested in accordance with ASTM C297/C297M based on load applied to the top and bottom layers of the panel.

10. Edgewise Compressive Strength: Not less than 5490 psi (37.85 MPa) when tested in accordance with ASTM C364/C364M based on compressive load applied at a rate 0.02 in/min (0.508 mm / min)

11. Flatwise Tensile Bond Strength: Not less than 220 psi (1.52 MPa) when tested in accordance with ASTM C365 based on compressive load applied at to and bottom layer of panel

12. Shear Strength by Beam Flexure: Not less than the following based on testing in accordance with ASTM C393/C393M (loaded in flexure with facing side in tension at a cross head speed of 0.025 in/min (0.635 mm / min):

1. Maximum Core Shear Strength of not less than 137 psi (0.94 MPa)
2. Facing Bending Stress of not less than 1180 psi (8.14 MPa)

13. Flexure Creep: Net creep of 0.029 inch per day (0.74 mm per day) based on testing in accordance with ASTM C480/C480M (based on midspan loading with stone-facing side in tension at a cross head speed of 0.025 in/min. (0.635 mm / min)

14. Flexural Strength (composite panel): not less than 3311psi (22.83 MPa) based on testing per ASTM C880/C880M.

15. Tensile Properties of adhesive bond: No Failure of adhesive bond based on testing per ASTM C897

16. Rivet withdrawal test: Not less than 477.5 lbs-f (2.124 kN) when tested at a rate of 0.098 in / min (2.5 mm/min) in accordance with ASTM D1761

17. Damage resistance testing of sandwich constructions: No panel deformation in accordance with ASTM D7766/D7766M based on loading applied at midpoint of panel using 1/2 inch (13 mm) diameter hemispherical steel indenter at a rate of 0.01 in/min (0.254 mm / min) until a drop-in load was observed.

18. Cyclic Pressure Loading: Pass per ASTM E1886. Not less than 3,500 positive and negative pressure cycles applied at a pressure of ± 60 psf (2880 Pa)

19. Air Infiltration: Air leakage (infiltration and exfiltration) of not more than 0.002 cfm/sq. ft.(0.01 L/s per sq. m) when tested according to ASTM E283 at test-pressure difference of 1.57 lbs/sq.ft (75 Pa)

20. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at 15 lbf/sq. ft (720 Pa)

21. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 in accordance with the following:

1. Large-Missile Test: Pass; a weighted 2x4 projectile fired at the panel at 50 ft/s (15.24 m/s).

22. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

3. Fire Performance:

1. System Fire Propagation Characteristics: pass per NFPA 285;
2. Panel Fire Performance:
3. Flame spread less than 10 and smoke developed less than 155, in accordance with ASTM E84
4. Reaction to fire classification: A2-s1, d0, in accordance with EN 13501-1:2018.

4. Rain Screen Principle:

1. Design drainage system to provide clear, internal paths of drainage of any trapped moisture within construction to exterior. Incorporate means of draining moisture to exterior.

5. Electrical Characteristics:

1. Provide materials to fabricate functioning photovoltaic systems in accordance with ASTM, IEEE, NEMA, NFPA and UL requirements, as specified in this section, and as shown on Drawings.
2. System operating temperature shall be from -40 deg F to +185 deg F (-40 deg C to +85 deg C). Minimum Performance Parameters of PV system: to IEC/UL 61730 and UL 61215
3. Salt Mist Corrosion Resistance: Pass to level 6 of IEC 61701
4. Dust and Sand Resistance: Pass to IEC 60068-2-68
5. Ammonia Corrosion Resistance: Pass to IEC 62716
6. Potential-Induced Degradation (PID) Resistance: Pass to IEC 62804-1

2.3 PANEL ASSEMBLY

1. Provide PV cladding system manufactured from panels fabricated from laminated glass consisting of the following:

1. Minimum 0.12 inch (3.2 mm) thick tempered glass conforming to ASTM C1048, Kind FT (fully tempered) with manufacturer's proprietary UV-resistant and fade-resistant decorative finish.
 1. Finish: **[As selected from manufacturer's standard range including glossy, satin, super satin] [Custom based on photographs supplied by Architect]**
2. Encapsulation: 0.03inch (0.76 mm) thick encapsulation consisting of EVA interlayer, photovoltaic cells and EVA interlayer.
 1. Photovoltaic Cells: Monocrystalline silicon solar cells, listed to UL 1703 with performance characteristics ($\pm 10\%$) of typical PV Module at Standard Test Conditions (STC = 77°F (25°C) cell temperature, 5.28 Btu m/ sq. ft (1000 W/m²) irradiance at Air Mass of 1.5 spectrum) as follows:

MITREX Spec Note: Update the information below based on the project requirements and power requirements for the project. Mitrex manufactures sizes to suit project requirements. The following 3 sizes are provided below for guidance. The 80 inch x 39 inch panel is Mitrex's standard panel.

1. [80 inches x 39 inches (2032 mm x 990 mm)]
 1. Nominal Maximum Power (Pmax): 390W
 2. Maximum Power Voltage (Vmp) = 41.9V
 3. Maximum Power Current (Imp) = 9.31A
 4. Open Circuit Voltage (Voc) = 47.2V
 5. Short Circuit Current (Isc) = 9.77A
 6. Module efficiency = 19.2%
 7. Power tolerance = +/- 5%
 8. Maximum series fuse rating = 20A]
2. [48 inches x 24 inches (1220 mm x 610 mm)]
 1. Nominal Maximum Power (Pmax): 95W
 2. Maximum Power Voltage (Vmp) = 10.4V
 3. Maximum Power Current (Imp) = 9.13A
 4. Open Circuit Voltage (Voc) = 11.8V
 5. Short Circuit Current (Isc) = 9.77A
 6. Module efficiency = 12.8%
 7. Power tolerance = +/- 5%
 8. Maximum series fuse rating = 20A]
3. [125 inches x 80 inches (3175 mm x 2030 mm)]
 1. Nominal Maximum Power (Pmax): 1200W
 2. Maximum Power Voltage (Vmp) = 132.0V
 3. Maximum Power Current (Imp) = 9.09A
 4. Open Circuit Voltage (Voc) = 154.2V
 5. Short Circuit Current (Isc) = 9.73A
 6. Module efficiency = 18.6%
 7. Power tolerance = +/- 5%
 8. Maximum series fuse rating = 20A]

3. Honeycomb core with non-combustible/non-conductive back sheet.

2.4 CORE MATERIAL

MITREX Spec Note: Edit square brackets below to reflect project conditions. Mitrex can generally customize all aspects of its panels. If in doubt, contact Mitrex at info@mitrex.com

1. Honeycomb core: Not less than 1 inch (25 mm), aerospace-grade lightweight aluminum honeycomb core with [3000] [4000] [6000] series aluminum with following characteristics:
 1. Typical Cell Size: 0.20 inch (5 mm)
 2. Density: Manufacturer's standard as required for application.
 3. Foil: 0.002 inch (0.05 mm)
 4. Core Type: Type B - Non-combustible welded core.
2. Top and bottom sheet: Not less than 0.02 inch (0.5 mm) thick.

3. Adhesive system: Manufacturer's recommended epoxy resin adhesive system with following performance characteristics specified in this Section.

2.5 SUBFRAMING

1. Provide manufacturer's standard interlocking sections manufactured from ASTM B221, extruded aluminum alloy or anchor plate sections manufactured from aluminum alloy 6061-T5 or 6063-T6 and as required for support and alignment of faced cladding panel system.
 1. Air space: Not less than 1 inch (25 mm)
 2. Basis-of-Design: "CL Interlocking Channel/CL Anchor plate system" by Mitrex.
2. **[Thermally-Broken Sub-framing: Provide low-conductivity thermally-broken, intermittent structural attachment insulation clips designed maintain insulation effectiveness, with adjustable depth and suitable for vertical and horizontal sub-girts.]**

2.6 PANEL ACCESSORIES

1. Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of panels unless otherwise indicated.
2. Panel Fasteners: Manufacturer's recommended fasteners and rivets designed to withstand design loads. Where exposed fasteners are unavoidable, provide with heads matching color of panels.
3. Sealants: ASTM C920; elastomeric silicone sealant of type, grade, class, and use classifications required to seal joints, and as recommended in writing by panel manufacturer.
4. Electrical Components
 1. Junction Box: IP67, 3 by-pass diodes.
 2. Connector: TE or MC4; suitable for solar panels.
 3. Coordinate with Division 26 for provision of connections and coordination of electrical characteristics.

2.7 FABRICATION

1. Provide factory-formed and -assembled, honeycomb wall panels fabricated from lightweight (aircraft quality) aluminum honeycomb bonded having epoxy-impregnated aluminum panel skins. Provide panels formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.
2. Fabricate and finish faced cladding panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
3. Fabrication Tolerances:

1. Nominal Thickness:
 1. More than 1/2 inch (13 mm) up to and including 2 inches (50 mm): $\pm 1/8$ inch (3 mm)
2. Flatness: deviation from flatness of surface must not exceed 0.2" % of panel length, but never more than 1/4 inch (6 mm).
3. Length and Width for sawn edges 2 inches (50 mm) or less:
 1. Less than 24 inches (610 mm): $\pm 1/16$ inch (1.5 mm)
 2. More than or equal to 24 inches (610 mm): $\pm 1/8$ inch (3 mm)
 3. Maximum angle tolerance: $\pm 0.2\%$

2.8 FINISHES

1. Carry out surface finishing uniformly to edges of cladding panel. Where surface finishing of panels involves use of patching, fillers or similar products, faults or cracks, it shall be considered as part of the normal finishing process.
2. Surfaces must have a regular appearance as a function of finishing process and worked to meet specified finish on exposed surfaces.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

1. Compliance: comply with manufacturer's latest written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 EXAMINATION

1. Examine substrates, areas, and conditions, with Subcontractor present, for compliance with requirements required for installation tolerances, supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by faced cladding panel manufacturer.
 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by faced cladding panel manufacturer.
 3. Verify that air-barriers/vapor-retarders have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
2. Examine roughing-in for components and assemblies penetrating faced cladding panels to verify actual locations of penetrations relative to seam locations of faced cladding panels before installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

1. Miscellaneous Supports: Install sub-framing, furring, **[thermally-broken subframing]** and other miscellaneous panel support members and anchorages according to ASTM C754 and faced cladding panel manufacturer's written recommendations.

3.4 FACED CLADDING PANEL INSTALLATION

1. Install faced cladding panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor faced cladding panels and other components of the Work securely in place, with provisions for thermal and structural movement.
2. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by stone-faced honeycomb material panel manufacturer.
3. Install attachment assembly required to support faced cladding panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels. Do not apply sealants to panel joints unless otherwise indicated.
 1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
 2. Install support assembly at locations, spacings, and with fasteners recommended by fabricator. Use Fabricator's standard horizontal and vertical tracks that provide support, secondary drainage assembly, and draining to the exterior.
4. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
5. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
6. Wiring Installation: to NFPA 70
 1. Utilize on-site measurements in conjunction with engineering designs to accurately cut wires and layout before making permanent connections.
 2. Locate wires out of way of windows, doors, openings, and other hazards.
 3. Ensure wires are free of snags and sharp edges that have the potential to compromise the wire insulation.

3.5 FIELD QUALITY CONTROL

1. Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
2. Tests: Perform tests in accordance with the manufacturer's written recommendations.

3.6 ADJUSTING, CLEANING, AND PROTECTION

1. Remove temporary protective coverings and strippable films, if any, as faced cladding panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of faced cladding panel installation, clean finished surfaces as recommended by faced cladding panel manufacturer. Maintain in a clean condition during construction.
2. After faced cladding panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
3. Replace faced cladding panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
4. Protect finished work in accordance with Product Requirements specified in Division 01.
5. Do not permit adjacent work to damage the work of this Section.
6. Upon completion of acceptance checks, settings, and tests, demonstrate that in-service PV electrical power generation system is in good operating condition and properly performing the intended function. Coordinate with Division 26.
7. Do not pressure wash PV cladding panels.
8. Adhere to procedures commonly used for cleaning windows on high-rise buildings. Avoid performing cleaning on panels during hottest periods of the day (i.e. middle of the day).

END OF SECTION 07 44 63.01

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