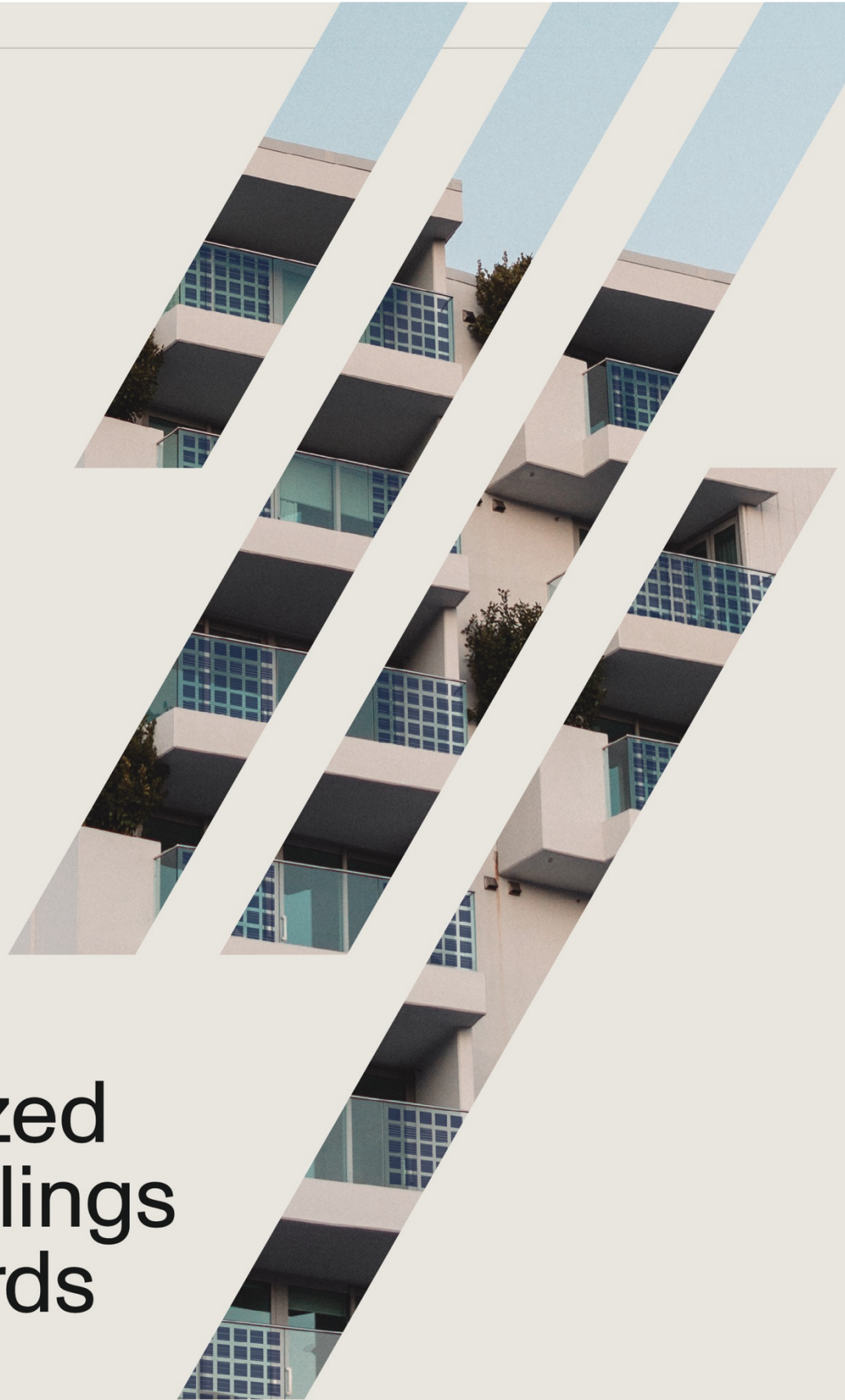




BIPV Glazed Metal Railings And Guards

Canadian 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 consultant. 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 Industries 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 MITREX systems:

Building-integrated PV glazed railings

PART 1 - GENERAL

1.1 SUMMARY

1. Provide labour, materials, products, equipment and services to complete the building-integrated PV glazed railings specified herein. This includes, but is not necessarily limited, to:
 1. Decorative railings and guards with extruded aluminum base shoes, handrails and PV glazing infills;
 2. Glazing sealants and accessories.
 3. Auxiliary materials required for a 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 51 00, Metal Stairs: for steel tube railings included with metal stairs.
2. Section 06 10 00, Rough Carpentry: for miscellaneous wood blocking.
3. Section 07 92 00, Joint Sealants: for field-applied sealants not otherwise specified in this Section.
4. Division 26 – Electrical: For the 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.
4. American Architectural Manufacturers Association (AAMA)
 1. AAMA 611, Voluntary Specification for Anodized Architectural Aluminum.
5. ASTM International
 1. ASTM A240/A240M: Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 2. ASTM A276: Standard Specification for Stainless Steel Bars and Shapes
 3. ASTM A312/A312M, Standard Specification for Seamless and Welded Austenitic Stainless-Steel Pipes.
 4. ASTM A554, Specification for Welded Stainless Steel Mechanical Tubing.
 5. ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.
 6. ASTM B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 7. ASTM B221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 8. ASTM C1048, Heat Treated Flat Glass, Kind HS, Kind FT, Coated and Uncoated.
 9. ASTM E1300: Standard Practice for Determining Load Resistance of Glass in Buildings
 10. ASTM E772: Standard Terminology of Solar Energy Conversion
6. Canadian General Standards Board (CGSB)

1. CAN/CGSB 12.1: Safety Glazing
2. CAN/CGSB 12.20: Structural Design of Glass for Buildings
7. CSA International
 1. CSA C22.1: Canadian Electrical Code, Part I, Safety Standard for Electrical Installations
8. Institute of Electrical and Electronics Engineers (IEEE)
 1. IEEE 100 CD: Standards Dictionary: Glossary of Terms And Definitions
9. Underwriters Laboratories (UL)
 1. UL 1703: Standard for Flat-Plate Photovoltaic Modules and Panels

1.4 DEFINITIONS

1. Electrical and Electronics Terminology: Unless otherwise specified or indicated, electrical and electronics terminology used shall herein be as defined by IEEE 100 CD.
2. Solar Energy Conversion and Solar Photovoltaic Energy System Terminology: Unless otherwise specified or indicated, 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

Retain "Preinstallation Meeting" Paragraph below if Work of this Section is extensive or complex enough to justify a Meeting.

1. Preinstallation Meeting: Conduct Meeting at Project site.

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

1. Meet with Owner, Consultant, Subcontractor, manufacturer's representative, structural-support Subcontractor, and Subcontractors whose work interfaces with or affects building-integrated PV glazed railings, including installers of curtain walls, windows, and storefronts.
1. Review temporary protection requirements for glazing during and after installation.
2. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

3. Review temporary protection requirements for building-integrated PV glazed railings during and after installation.
4. Document proceedings, including corrective measures and actions required, and Supply copy of record to each participant.
2. Agenda: review progress of other construction activities and preparations for the particular activity under consideration.
3. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
4. Scheduling: Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Sequencing: Sequence work to permit installation of materials in conjunction with related materials and seals.

1.6 PRECONSTRUCTION TESTING

1. Preconstruction Adhesion and Compatibility Testing: Test glazing, sealants, gaskets, accessories, and glass-framing members for adhesion to, and compatibility with elastomeric glazing sealants.
2. Schedule enough time for testing and analyzing results to prevent delaying the Work.

1.7 ACTION SUBMITTALS

1. Product Data: Submit in accordance with Division 01 for the following:
 1. Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 2. Include components such as wiring, PV-modules, and other electrical components. Coordinate with Division 26.
 3. Submit WHMIS SDS Safety Data Sheets in accordance with requirements of Division 01.
2. **[Sustainable Design Submittals:**
 1. **Comply with project requirements intended to achieve sustainable design, measured and documented according to the LEED Green Building Rating System of the Canadian Green Building Council. Provide submittals as required by Consultant.]**
3. Shop Drawings: Submit in accordance with Division 01 for building-integrated PV glazed railing work.
 2. Glazing Schedule: List glass types and thicknesses for each size and location. Use same designations indicated on Drawings.
 3. Include diagrams for power, conduits, and wiring.
4. Samples: Submit in accordance with Division 01, for each type of exposed finish required, prepared on Samples of size indicated below.

1. Submit samples of PV railing systems, made from full-size components, including top rail, post, handrail, and PV glass infill.
2. Submit 300 mm (12 inches) square of each type of PV glass products illustrating typical exterior railing assembly, including typical junction box and associated wiring.
5. Warranties: Submit sample of extended warranties specified in this Section for Consultant's review.
6. Quality Assurance Submittals: submit the following in accordance with Division 01.
 1. Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
7. Professional Engineer's Stamped Shop Drawings and Submittals: Submit engineered and stamped shop drawings for building-integrated PV Glazed railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation in accordance with Division 01.

1.8 CLOSEOUT SUBMITTALS

1. Maintenance Data: Submit operation and maintenance data for each type of PV glazing 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 manufacturer.
2. Safety Glazing Labeling: Permanently mark glass with certification label of certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
3. Mock-ups: Build mock-ups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 1. Reviewed mock-ups may become part of the completed Work if undisturbed at time of Substantial Performance of the Work.
4. Source Limitations: Obtain primary components of building-integrated PV glazed railings assemblies, from single manufacturer. Obtain secondary components and accessories from sources acceptable to manufacturer of primary materials.

1.10 DELIVERY, STORAGE AND HANDLING

1. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Inspect components for damage upon delivery.
2. Storage: Store products in a secure enclosed area protected from the elements, in manufacturer's packaging until ready for installation.

3. 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 building-integrated **PV glazed railings** to be performed according to manufacturers' written instructions and warranty requirements.

1.12 COORDINATION

1. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.13 WARRANTY

1. Extended 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 – building-integrated PV glazed railings:
 1. Solar photovoltaic cells: 25 years from date of Substantial Performance of the Work.
 2. Power output: 25 years manufacturer's power output warranty, at 80% minimum rated power output of the initial nominal power by year 25.
 3. 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. **Consultant will consider requests for substitution if received [10] days before Bid Closing Deadline. Requests received after that time will be rejected. Consultant 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 REGULATORY REQUIREMENTS

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

1. Comply with applicable provisions in the **[Ontario Building Code,]** and requirements of authorities having jurisdiction.

2.3 DESIGN AND PERFORMANCE REQUIREMENTS

1. Professional Engineering Design and Certification: Design railings, including comprehensive engineering analysis by a Professional Engineer licensed to practice in the Province of Ontario, in accordance with requirements of Ontario Building Code, and using performance requirements and design criteria indicated in this Section.
2. Structural Performance of Railings:
 1. Design building-integrated PV glazed railings systems to withstand live loads and dead loads and wind loads without loss or glass breakage due to defective manufacturing, fabrication, or installation.
 2. Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to design pressures indicated **[on Structural Drawings] [xxx kPa]** to ASTM E330 and CAN/CGSB-12.20.
 3. Railings shall withstand the effects of gravity loads according to the minimum requirements of the **[Ontario Building Code Part 4 for structural design, and OBC Supplementary Standard SB-13 for glass selection.]**
 4. Confirm final glazing thicknesses by analyzing Project loads and in-service conditions.
 5. Glass-Supported Railings: Support each section of top rail by a minimum of three glass panels or by other means so top rail will remain in place if any one panel fails.
3. Safety Glazing: Where safety glazing is required, provide glazing that complies with CGSB 12.1.

MITREX Spec Note: If the loads acting on the glass are known, include them below. Often times, they are noted on the Structural Drawings of the Project.

4. Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to design pressures indicated **[on Structural Drawings] [xxx kPa]** to ASTM E330 and CAN/CGSB-12.20.
5. 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.
6. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
7. Electrical Characteristics:
 1. Provide materials to fabricate functioning photovoltaic systems in accordance with CSA, ASTM, IEEE, NEMA, and cUL requirements, as specified in this section, and as shown on Drawings.
 2. System operating temperature shall be from -40 deg C to +85 deg C.
 3. Minimum Performance Parameters of PV system: to UL 1703.

2.4 MATERIALS

1. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
2. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
3. Aluminum: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required.
 1. Extruded Bars and Shapes: ASTM B221/ASTM B221M, Alloy 6063-T5/T52.
 2. Plate and Sheet: ASTM B209/ASTM B209M, Alloy 5005-H32 or Alloy 6061-T6.

MITREX Spec Note: Select stainless grades below. Typically Type 316 is more suited for exterior and/or corrosive environments.

4. Stainless Steel:
 1. Tubing: ASTM A554, **[Grade MT 304] [Grade MT 316]**.
 2. Pipe: ASTM A312/A312M, **[Grade TP 304] [Grade TP 316]**.
 3. Sheet, Strip, Plate, and Flat Bar: ASTM A666 or ASTM A240/A240M, **[Type 304] [Type 316]**.
 4. Bars and Shapes: ASTM A276, **[Type 304] [Type 316]**.

2.5 GLASS FOR PV RAILINGS AND GUARDS

MITREX Spec Note: Choose below from thin-film or monocrystalline silicon technology. The choice is dependent on the required power output as well as the aesthetics of the project. Speak to a MITREX representative for more information. Remove paragraphs that do not apply.

1. [Laminated PV glass with monocrystalline silicon technology: Minimum 6 mm (1/4 inch) thick units (nominal) fabricated as follows:
 1. 3 mm (1/8 inch) thick low-iron tempered glass conforming to ASTM C1048, Kind FT (fully tempered) or CAN/CGSB-12.1
 2. Encapsulation: 0.76 mm (0.03 inch) thick encapsulation consisting of EVA interlayer, photovoltaic cells and EVA interlayer as follows:
 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 = 25°C cell temperature, 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.

1. 1220 mm x 1100 mm (48 inches x 43.3 inches), 30% transparency – Monocrystalline Silicon
 1. Nominal Maximum Power (P_{max}): 190W
 2. Maximum Power Voltage (V_{mp}) = 20.9V
 3. Maximum Power Current (I_{mp}) = 9.3A
 4. Open Circuit Voltage (V_{oc}) = 23.6V
 5. Short Circuit Current (I_{sc}) = 9.77A
 6. Module efficiency = 14.2%
 7. Power tolerance = +/- 5%
 8. Maximum series fuse rating = 20A
3. 3 mm (1/8 inch) thick low-iron tempered glass conforming to ASTM C1048, Kind FT (fully tempered) or CAN/CGSB-12.1]
2. [Laminated PV glass with Thin-Film Technology: Minimum 18 mm (0.70 inch) thick units (nominal) fabricated as follows:
 1. 6 mm (1/4 inch) thick low-iron tempered glass conforming to ASTM C1048, Kind FT (fully tempered) or CAN/CGSB-12.1
 2. Encapsulation: 0.76 mm (0.03 inch) thick encapsulation consisting of EVA interlayer, photovoltaic cells and EVA interlayer.
 1. Photovoltaic Cells: Thin-film solar cells, listed to UL 1703 with performance characteristics ($\pm 10\%$) of typical PV Module at Standard Test Conditions (STC = 25°C cell temperature, 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.

1. **[1200mm x 1100mm (47.2 inches x 43.3 inches), 20% transparency – Thin Film**
 1. **Nominal Maximum Power (Pmax): 118W**
 2. **Maximum Power Voltage (Vmp) = 87.6V**
 3. **Maximum Power Current (Imp) = 1.35A**
 4. **Open Circuit Voltage (Voc) = 119.2V**
 5. **Short Circuit Current (Isc) = 1.57A**
 6. **Module efficiency = 8.9%**
 7. **Power tolerance = +/- 5%**
 8. **Maximum series fuse rating = 2A]**
3. 6 mm (1/4 inch) thick low-iron tempered glass conforming to ASTM C1048, Kind FT (fully tempered) or CAN/CGSB-12.1
4. Interlayer: 0.76 mm (0.03 inch) thick EVA interlayer.
5. 6 mm (1/4 inch) thick low-iron tempered glass conforming to ASTM C1048, Kind FT (fully tempered) or CAN/CGSB-12.1]

2.6 BASE SHOE

MITREX Spec Note: Select one of the following profiles based on mounting detail

1. Manufacturer's standard **[Aluminum] [Stainless-steel clad aluminum]** base shoe designed for **[Surface Mount] [Fascia Mount]** modified to accommodate electrical conduits.
2. **[Surface Mount Profile: 81 mm (3-3/16 inches) wide by 122.2 mm (4-13/16 inches) high rectangular cross-section designed to accept laminated glass.]**
3. **[Fascia Mount Profile: 75 mm (2-15/16 inches) wide by 124 mm (4-13/16 inches) high rectangular cross-section designed to accept laminated glass.]**
4. Basis-of-Design: **[CRL L56S Series] [CRL 9BL56 Series] [CRL L68S Series] [CRL 9BL68S Series] [CRL L21S Series] [CRL 9BL21 Series] [CRL L25S Series]** Base Shoe by CR Laurence designed to work with CRL's TAPER-LOC® Dry Glazed System

MITREX Spec Note: Select profiles for caps based on design. Delete items that do not apply to the project.

2.7 METAL CAP RAILING

1. Material: **[Aluminum] [Stainless-steel]**
2. Radius Profile Cap Rail:
 1. **[Part # GR15, round 38 mm (1-1/2 inches) diameter.]**
 2. **[Profile: Part # GR16, round 42.2 mm (1.66 inches) diameter.]**
 3. **[Profile: Part # GR19, round 48.3 mm (1-7/8 inches) diameter (aluminum only)]**
 4. **[Profile: Part # GR20, round 51 mm (2 inches) diameter.]**

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5. [Profile: Part # GR25, round 63.5 mm (2-1/2 inches) diameter.]
 6. [Profile: Part # GR30, round 76.2 mm (3 inches) diameter.]
 7. [Profile: Part # GR35, round 88.9 mm (3-1/2 inches) diameter.]
 8. [Profile: Part # GR40, round 101.6 mm (4 inches) diameter.]
3. Square Profile Cap Rail:
1. [Profile: Part # GRS15, square 38 mm (1-1/2 inches)]
 2. [Profile: Part # GRS20, square 51 mm (2 inches)]
 3. [Profile: Part # GRS25, square 63.5 mm (2-1/2 inches)]
 4. [Profile: Part # GRSC15, crisp corner square 38 mm (1-1/2 inches)]
 5. [Profile: Part # GRSC20, crisp corner square 51 mm (2 inches)]
4. U-Channel:
1. [Profile: Part # GRCF, crisp corner u-channel 38 mm (1-1/2 inches)]
 2. [Profile: Part # GRCR, crisp corner radius top u-channel 38 mm (1-1/2 inches)]
 3. [Profile: Part # GRL10, low profile 11 gauge u-channel 33.3 mm (1-5/16 inches) high.]
 4. [Profile: Part # GRLC10, crisp corner low profile 11 gauge u-channel 33.3 mm (1-5/16 inches) high.]
 5. [Profile: Part # GRUC, u-channel 38 mm (1-1/2 inches)]
5. Solid Aluminum Cap Rail:
1. [Profile: Part # 324, CRL-Blumcraft square 35 mm (1-3/8 inches)]
 2. [Profile: Part # 337, CRL-Blumcraft round 51 mm (2 inches) diameter.]
 3. [Profile: Part # 338, CRL-Blumcraft round 63.5 mm (2-1/2 inches) diameter.]
 4. [Profile: Part # 339, CRL-Blumcraft rectangular 44.4 x 90 mm (1-3/4 inches x 3-1/2 inches)]
 5. [Profile: Part # 376, CRL-Blumcraft elliptical 68.2 mm (2-11/16 inches)]
 6. [Profile: Part # 398, CRL-Blumcraft rectangular 102 mm (4 inches)]
 7. [Profile: Part # 636, CRL-Blumcraft rectangular 44.5 x 102 mm (1-3/4 inches x 4 inches)]
 8. [Profile: Part # 637, CRL-Blumcraft rectangular 44.5 mm x 127 mm (1-3/4 inches x 5 inches)]

9. [Profile: Part # 638, CRL-Blumcraft rectangular 44.5 x 152 mm (1-3/4 inches x 6 inches)]
10. [Profile: Part # GR0V4, oval 101.6 mm x 63.5 mm (4 inches x 2-1/2 inches) (aluminum only)]

2.8 WOOD CAP RAILING

1. Radius Profile Cap Rail:
 1. [Profile: Part # WCR20, CRL round 51 mm (2 inches) diameter.]
 2. [Profile: Part # WCR25, CRL round 63.5 mm (2-1/2 inches) diameter.]
 3. [Profile: Part # WCR30, CRL round 76.2 mm (3 inches) diameter.]
 4. [Profile: Part # 346, CRL-Blumcraft round 51 mm (2 inches) diameter.]
 5. [Profile: Part # 347, CRL-Blumcraft round 63.5 mm (2-1/2 inches) diameter.]
2. Square Profile Cap Rail:
 1. [Profile: Part # 397, CRL-Blumcraft 44.5 x 54 mm (1-3/4 inches x 2-1/8 inches)]
 2. [Profile: Part # 372, CRL-Blumcraft 51 x 95.3 mm (2 inches x 3-3/4 inches)]
 3. [Profile: Part # 373, CRL-Blumcraft 114.3 x 41.3 mm (4-1/2 inches x 1-5/8 inches)]
 4. [Profile: Part # 631, CRL-Blumcraft 63.5 x 102 mm (2-1/2 inches x 4 inches)]
 5. [Profile: Part # 632, CRL-Blumcraft 63.5 x 152 mm (2-1/2 inches x 6 inches)]
 6. [Profile: Part # 633, CRL-Blumcraft 63.5 x 203 mm (2-1/2 inches x 8 inches)]

2.9 ACCESSORIES

1. Handrail Brackets: [Aluminum] [Stainless-steel] [Brass]; Finish: Match handrail cap finish
2. Provide products of material, size, and shape complying with referenced glazing standards, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
3. Compatibility and Suitability: Ensure sealants are compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application.
4. Setting blocks: silicone, 80-90 Shore A durometer hardness, to suit glazing method, glass light weight and area.
5. Spacers: blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

6. Glazing Gaskets: Glazing gaskets and related accessories recommended or supplied by railing manufacturer for installing glass infill panels in post-supported railings.
7. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable.
8. Anchors: Provide anchors capable of sustaining, without failure, loads imposed with appropriate safety factors when installed.
9. 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 for electrical characteristics.

2.10 FABRICATION

1. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying required, to comply with system performance requirements.
2. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
3. Form work true to line and level with accurate angles and surfaces.
4. Fabricate connections that will be exposed to weather in a manner to drain water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
5. Provide conduits where indicated on Shop Drawings for connecting PV elements to building electrical infrastructure.

2.11 GENERAL FINISH REQUIREMENTS

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
3. Aluminum:
 1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
4. Stainless Steel:
 1. Directional Satin Finish: No. 4 conforming to AISI requirements.

2. Run grain of directional finishes with long dimension of each piece.

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 for installation tolerances, supports, and other conditions affecting performance of the Work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 BUILDING-INTEGRATED PV GLAZED RAILINGS INSTALLATION

1. Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
2. Install building-integrated PV glazed railings according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings.
3. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
4. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
5. Fit exposed connections together to form tight, hairline joints.
6. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
7. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
8. Set posts plumb within a tolerance of 2 mm in 1 m (1/16 inch in 3 feet).
9. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 5 mm in 3 m (1/4 inch in 12 feet).
10. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
11. Adjust railings before anchoring to ensure matching alignment at abutting joints.

12. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.
13. Wiring Installation: to CSA C22.1/CE Code.
 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.

3.4 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.

3.5 ADJUSTING, CLEANING, AND PROTECTION

1. Clean aluminum and stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
2. Remove nonpermanent labels and clean surfaces immediately after installation.
3. Protect glass from contact with undesirable substances resulting from construction operations.
4. If, despite such protection, contaminating substances come into contact with glass, remove substances immediately. Remove and replace glass that cannot be cleaned without damage to coatings.
5. Remove and replace glass that is damaged during construction period.
6. Wash glass on both exposed surfaces prior to Substantial Performance of the Work. Wash glass as recommended in writing by glass manufacturer.
7. Upon completion of acceptance checks, settings, and tests, demonstrate that in-service building-integrated PV electrical power generation system is in good operating condition and properly performing the intended function. Coordinate with Division 26.

END OF SECTION

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