

GRAND MASTER SPECIFICATION FOR INTERNATIONAL PROJECTS
Window Washing Equipment

SPEC NOTE: This guide specification is basic and must be adapted to suit the requirements of individual projects. It is written in accordance with the North American CSC/CSI Three Part Section Format. Square brackets [] indicate choice, alternatives, data required or need for the specifier to make a decision. Remove square brackets, unwanted options, and SPEC NOTES before printing.

PART 1 - GENERAL

1.1 General Requirements

- .1 Comply with the conditions of the Contract and Division 1 - General Requirements.

1.2 Section Includes

- .1 Work of this section includes the design, supply and installation of window cleaning/suspended maintenance equipment

1.3 Related Sections

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|-----|--------------------------------------------------------------------|-----------------|
| .1 | Unloading and hoisting of equipment to roof | Section [01500] |
| .2 | Cast-in-place concrete, including installation of embedded items | Section [03300] |
| .3 | Precast concrete | Section [03400] |
| .4 | Structural Steel | Section [05120] |
| .5 | Open Web Steel Joists | Section [05210] |
| .6 | Metal Deck | Section [05310] |
| .7 | Catwalks | Section [05516] |
| .8 | Roofing | Section [07500] |
| .9 | Flashing | Section [07600] |
| .10 | Sealants | Section [07900] |
| .11 | Rigging access doors in walls | Section [08111] |
| .12 | Continuous track stabilization on exterior of building | Section [08800] |
| .13 | Installation of intermittent stabilization on exterior of building | Section [03400] |
| .14 | Hot & Cold water supply, faucets and drain at [every] roof level | Section [15400] |
| .15 | Three phase 208 volts, 60 Hertz service at [every] roof level | Section [16050] |

SPEC NOTE: Re 1.3.16. Specify independent protected main line power and weatherproof twist lock 230 volts, single phase, 50 Hertz, 20 amperes CEE normed receptacle for all power requirements except for a permanent powered platform/gondola which requires 400 volts, 3 phase, 50 Hertz, 20 amp service. Consideration to be given to including a power booster to maintain 400 volts. In Electrical Division specify electrical contractor to supply window washing manufacturer with sample receptacle to ensure compatibility with suspended maintenance requirements. Power to be located no more than 30 m (100'-0") from window cleaning/suspended maintenance equipment location. Outlets to experience no more than 3% voltage drop under full load current. Pro-Bel wall or roof anchors may be employed for strain relief. Contact Pro-Bel for requirements.

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| .16 | Weatherproof power supply outlets with strain relief anchors | Section [16132] |
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1.4 References

- .1 All products or equipment listed herein to conform to:
- .1 CAN/CSA-Z91-02 "Health and Safety Code for Suspended Equipment Operations".
- .2 CAN/CSA-Z271-98 "Safety Code for Suspended Elevating Platforms".
- .3 OSHA (U.S.) 1910.66, Subpart F (Powered Platforms).
- .4 European Standard EU8.0, pr EN 1808: Suspended Access Equipment.

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- .5 CSA S16.1 "Steel Structures for Buildings".
- .6 CSA S136 "Design of Steel Structural Members, Light Gauge".
- .7 CISC 2 "Standard Practice for Steel, Structural, for Buildings".
- .8 CSA W59 "Welded Steel Construction," and CSA W47 "Certification of Companies for Fusion Welding of Steel Structures".
- .9 CAN3-S157-M83 "Strength Design in Aluminum".
- .10 CAN3-S244-1969 "Welded Aluminum Design".
- .11 CSA-W47.2 – 1967 "Aluminum Welding Qualification Code".
- .12 CSA G164 "Galvanizing, Hot Dip, of Irregularly Shaped Articles".
- .13 AISC S342L-1993, Supplement No.1 "Load and Resistance Factor Design Specification for Structural Steel Buildings".
- .14 AISC SG-971-1996, with 2000 Supplement "Specification for Design of Cold-Formed Steel Structural Members".
- .15 Aluminum Association AA ADM-1-Aluminum Design Manual, 2000 " and AWS D1.2-1997 Structural Welding Code – Aluminum.
- .16 AWS D1.1-2000 Structural Welding Code – Steel.
- .17 ANSI/IWCA I -14.1-2001 Window Cleaning Safety Standard (General Industry Safety Standard, International Window Cleaning Association).
- .18 ASME A120.1-2001, Safety Requirements for Powered Platforms for Building Maintenance.

1.5 Design Requirements

- .1 Design window cleaning/suspended maintenance system to suit building and in accordance with plans, specifications, standards, and regulations/codes contained in sections 1.4 and 1.9.
- .2 Locate anchorages to suit suspension equipment that will be used on the building with respect to items such as reach, rigging, spacing, roof edge condition, and similar items.
- .3 Design all anchor components to provide adequate attachment to the building and suited to current window cleaning/suspended maintenance practices. Ensure compatibility with industry standard equipment.
- .4 Ensure all anchor components conform to proper engineering principles and have been designed by a Professional Engineer qualified in the design of window cleaning/suspended maintenance equipment, its application and safety requirements.
- .5 Design system fall arrest safety anchors and equipment supports to comply with the following structural requirements:
 - .1 Supports for Suspended Platforms/Gondolas: davits, rigging sleeves and monorails are used for suspending a powered platform from storage and rigging/working locations on the building. These supports and the structures to which they are attached are typically designed to 1000 lbs (4.45 kN) vertical service load plus impact with a factor of safety as per AISC requirements and/or ACI or other applicable construction codes, and to 4 times the rated load against fracture or detachment (i.e. 4 to 1 stability factor).

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.2 Fall Arrest Safety Anchors: designed to a maximum fall arresting force of typically 8.0 kN (1800 lbs.) when wearing a body harness with a safety factor of 2 without any permanent deformation and to 22.24 kN (5000 lbs.) against fracture or detachment.

1.6 Shop Drawings and Engineering Certification

- .1 Submit shop drawings showing complete layout and configuration of complete window cleaning/suspended maintenance system, including all components and accessories. Clearly indicate design and fabrication details, window “drops”, hardware, and installation details.
- .2 Shop drawings to include installation and rigging instructions and all necessary Restrictive and Non-Restrictive Working Usage Notes and General Safety Notes.
- .3 Shop drawings to be reviewed by a professional engineer, and upon request, complete with calculations and/or test reports.

1.7 Qualifications

- .1 Manufacturer: Work of this Section to be executed by manufacturer specializing in the design, fabrication and installation of window cleaning/suspended maintenance systems having a minimum of 5 years documented experience.
- .2 Loading and safety assurance: Work of this Section to meet the requirements of governing codes and jurisdiction and to comply with properly engineered loading and safety criteria for the intended use.
- .3 Insurance: Manufacturer to carry specific liability insurance (products and completed operations) in the amount of \$2,000,000.00 to protect against product/system failure.
- .4 Welding to be executed by certified welders in accordance with recognized standards stated herein.

1.8 Maintenance Data

- .1 Submit 1 copy of system Equipment Manual & Inspection Log Book, with “Initial Inspection - Certification for Use” and “Inspection Sign-Off” forms completed.
- .2 Submit 2 copies of a reduced plastic laminated as-built shop drawing showing equipment locations and details. This drawing is to be posted near exits onto the roof.

1.9 Regulatory Requirements

- .1 Comply with the following regulations:
 - .1 CAN/CSA-Z271-98 Safety Code for Suspended Elevating Platforms and CAN/CSA-Z91-02 Health and Safety Code for Suspended Equipment Operations.
 - .2 OSHA (U.S.) 1910.66, Subpart F (Powered Platforms)
 - .3 European Standard EU8.0, pr EN 1808: Suspended Access Equipment.

PART 2 - PRODUCTS

2.1 Manufacturer

- .1 This specification is based on systems currently being manufactured by PRO-BEL ENTERPRISES LTD. Toll free: 1-800-461-0575. Telephone: 905-427-0616, Fax: 905-427-2545, info@pro-bel.ca.
- .2 Other manufactured products meeting this specification may be substituted provided that manufacturers show

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proof of product insurance. Equipment details to be approved by the architect and/or consultant. Companies, such as miscellaneous metal fabricators, who are not normally engaged in the design and manufacture of window cleaning/suspended maintenance equipment are not permitted to bid.

2.2 Equipment

SPEC NOTE: List type and quantity as required.

- .1 [_____]
- .2 [_____]
- .3 [_____]

2.3 Safety & Tie-Back Anchors

SPEC NOTE: Delete items not required.

- .1 Safety U-bars: [Type 304 stainless steel with yield strength of 240 MPa (35 Ksi)] [mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164]. U-bar to be not less than 19 mm (3/4") diameter material with 38 mm (1-1/2") eye opening.
- .2 Securement bolts: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164.
- .3 Hollow steel section (HSS) piers: mild steel, Type 300W with yield strength of 350 MPa (50 Ksi). Wall thickness to suit application, [hot dipped galvanized to CSA G164][with Pro-Bel Protex 2.4 mm (3/32") thickness, black coloured two-component TPU polyurethane/polyurea coating system].
- .4 Base plate and all other sections: [galvanized][Pro-Bel Protex coated] mild steel as above with yield strength of 300 MPa (44 Ksi). Thickness and securement to suit application.

SPEC NOTE: Re 2.3.5. Specify aluminum flashing for BUR or modified bitumen roofs only (membrane above or below insulation). For single ply roofs, flashing to be in accordance with membrane manufacturer's instructions. Specify heat-shrink rubber collar flashing for PBE Series roof anchors (BUR or modified bitumen roofs) or s.s. cap for PB series roof anchors (any type roof).

- 5. Seamless spun aluminum flashing (for steel pier anchors): Type 6061-T6 alloy to ASTM B221-2000 with deck flange flashed in to recognized roofing standards. Seal top of aluminum flashing with [conformable mastic tape and torch applied heat-shrink rubber collar flashing] [detachable watertight stainless steel cap].
- .6 Miscellaneous bolts, nuts and washers: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164 or Type 304 stainless steel with yield strength of 240 MPa (35 Ksi).

2.4 Ground Rigged Davits

SPEC NOTE: Delete items not required.

- .1 Davit booms: Aluminum sections of engineered length and size to suit application, equipped with: carrying handles; [stainless steel rolling trolley] [stainless steel friction trolley] [galvanized fixed shackle] on outboard end; prominently displayed, non-corrosive data plate clearly stating Maximum Service Capacity of boom, Manufacturer's Name, Serial No. and Manufacturing Date; and designed to carry minimum vertical service load of 4.5 kN (1,000 lbs.), i.e. rated load.

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- .2 Davit masts: Round tubular [aluminum][steel] section capable of rotating through 360°; carrying handles; connecting pins.

SPEC NOTE: Re 2.4.3. U-bar safety (lifeline) anchors secured to davit bases are optional. If lifeline anchors are required farther back on the roof, see Pro-Bel Safety & Tie-back Anchors Specification.

- .3 Davit arms:
1. Davits to be demountable, portable, capable of being easily and quickly broken down into pieces weighing no more than 36.3 kg (80 lbs) for ease of carrying.
 2. A davit or part of a davit weighing more than 36.3 kg (80 lbs) to be provided with a means for its transport, which shall keep the center of gravity of the davit at or below 915 mm (36") above the safe surface during transport.
 3. Davits or davit components that require more than 36.3 kg (80 lbs) lifting effort to raise the arm into position to be provided with a mechanical means for hoisting them into position.
 4. Davit arm booms equipped with rolling trolleys or friction trolleys to have stops to ensure trolley cannot become detached from boom.
- .4 Davit bases: Round, hollow steel section piers of mild steel, Type 350W with yield strength of 350 MPa (50 Ksi), [hot dip galvanized to CSA G164], [with Pro-Bel Protex 2.4 mm (3/32") thickness black coloured two-component TPU polyurethane/polyurea coating system], [with] [without] 19 mm (3/4") diameter U-bar safety anchor, and securement to suit application.
- .5 Tethers: All pins and loose pieces to be secured using 3 mm (1/8") stainless steel cable complete with easily inserted lead connectors to avoid loss.
- .6 Plate and all other sections: [Galvanized][Pro-Bel Protex coated] mild steel as per davit bases above with yield strength of 300 MPa (44 Ksi).

SPEC NOTE: Re 2.4.7. For 300 series bases specify aluminum flashing for BUR or modified bitumen roofs only (membrane above or below insulation). For single ply roofs, flashing to be in accordance with membrane manufacturer's instructions.

- .7 Seamless spun aluminum flashing (for davit bases): Type 6061-T6 alloy to ASTM B221-2000 with deck flange flashed in to recognized roofing standards. Seal top of aluminum flashing with conformable mastic tape and torch applied heat-shrink rubber collar flashing.
- .8 Miscellaneous bolts, nuts and washers: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164 or Type 304 stainless steel with yield strength of 240 MPa (35 Ksi).

2.5 Roof Rigged Davits

SPEC NOTE: Delete items not required.

- .1 Davit booms: Aluminum sections of engineered length and size to suit application, equipped with: carrying handles; [stainless steel rolling trolley] [stainless steel friction trolley] [galvanized fixed shackle] on outboard end; prominently displayed, non-corrosive data plate clearly stating Maximum Service Capacity of boom, Manufacturer's Name, Serial No., and Manufacturing Date; and designed to carry minimum vertical service load of 4.5 kN (1,000 lbs.), i.e. rated load.
- .2 Davit masts: Round tubular [aluminum][steel] section capable of rotating through 360°; carrying handles; connecting pins; erection winch; turning handles; transport wheels.

SPEC NOTE: Re 2.5.3. U-bar safety (lifeline) anchors secured to davit bases are optional. If lifeline anchors are required farther back on the roof, see Pro-Bel Safety & Tie-back Anchors Specification.

- .3 Davit arms:

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- .1 Davits to be demountable, portable, capable of being easily and quickly broken down into pieces weighing not more than 36.3 kg (80 lbs) for ease of carrying.
 - .2 A davit or part of a davit weighing more than 36.3 kg (80 lbs) to be provided with a means for its transport, which shall keep the center of gravity of the davit at or below 915 mm (36") above the safe surface during transport.
 - .3 Davits or davit components, that require more than 36.3 kg (80 lbs) lifting effort to raise the arm into position be provided with a mechanical means for hoisting them into position.
 - .4 Davit arm booms equipped with rolling trolleys or friction trolleys to have stops to ensure trolley cannot become detached from boom.
 - .5 Tall roof rigged davits shall be designed with hoisting winches to safely raise and lower arms and dolly wheels to roll davit arms into place.
- .4 Davit bases: Round, hollow steel section piers of mild steel, Type 350W with yield strength of 350 MPa (50 Ksi), [hot dip galvanized to CSA G164], [with Pro-Bel Protex 2.4 mm (3/32") thickness black coloured two-component TPU polyurethane/polyurea coating system], [with] [without] 19 mm (3/4") diameter U-bar safety anchor, and securement to suit application.
 - .5 Tethers: All pins and loose pieces to be secured using 3 mm (1/8") stainless steel cable complete with easily inserted lead connectors to avoid loss.
 - .6 Plate and all other sections: [Galvanized][Pro-Bel Protex coated] mild steel as per davit bases above with yield strength of 300 MPa (44 Ksi).
 - .7 Flashing (for davit bases): Flashing to be in accordance with membrane manufacturer's recommendations.
 - .8 Miscellaneous bolts, nuts and washers: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164 or Type 304 stainless steel with yield strength of 240 MPa (35 Ksi).

2.6 Outrigger Beams

SPEC NOTE: Delete items not required.

- .1 Outrigger beams: [aluminum I-beams] [galvanized steel I-beams] [galvanized hollow steel sections] with non-corrosive, prominently displayed data plate clearly stating Maximum Service Capacity of beam, Manufacturer's Name, Serial No. and Manufacturing Date; and designed to carry minimum vertical service load of 4.5 kN (1,000 lbs); of engineered length and size to suit application complete with [shackle] [friction U-bar] [trolley] on outboard end. Beams equipped with rolling trolleys or friction trolleys to have stops to ensure trolley cannot become detached from beam.

SPEC NOTE: Some very long outrigger beams are designed specifically for bosun's chair with descent control equipment. For this restrictive application, vertical service load will be less than 4.5 kN (1,000 lbs). Consult with Pro-Bel for recommendations.

- .2 Safety U-bars: [Type 304 stainless steel with yield strength of 240 MPa (35 Ksi)] [mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164]. U-bar to be not less than 19 mm (3/4") diameter material with 38 mm (1-1/2") eye opening.
- .3 Outrigger base/roof anchor hollow steel section (HSS) piers: mild steel as above with yield strength of 350 MPa (50 Ksi). Wall thickness and securement to suit application, [hot dipped galvanized to CSA G164][with Pro-Bel Protex 2.4 mm (3/32") thickness, black coloured, two-component TPU polyurethane/polyurea coating system].
- .4 Swivel-type beam bases: round hollow section (HSS) piers of mild steel, Type 350W with yield strength of 350 MPa (50 Ksi) hot dipped galvanized to CSA G164[Pro-Bel Protex coated]; capable of easily rotating through 360° under load; with connecting pins; safety U-bar as above.
- .5 Beam dolly: [galvanized steel] [aluminum] with pneumatic type rubber wheels, sized to suit beam.

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- .6 Tethers: all pins and loose pieces to be secured using 3 mm (1/8") stainless steel cable complete with easily inserted lead connectors to avoid loss.
- .7 Base plate and all other sections: [galvanized][Pro-Bel Protex coated] mild steel as above with yield strength of 300 MPa (44 Ksi). Thickness and securement to suit application.

SPEC NOTE: Re 2.6.8. Specify aluminum flashing for BUR or modified bitumen roofs only (membrane above or below insulation). For single ply roofs, flashing to be in accordance with membrane manufacturer's instructions. Specify conformable mastic tape and heat-shrink rubber collar flashing for PBE Series roof anchors (BUR or modified bitumen roofs).

- .8 Seamless spun aluminum flashing (for steel pier anchors): Type 6061-T6 alloy to ASTM B221-2000 with deck flange flashed in to recognized roofing standards. Seal top of aluminum flashing with conformable mastic tape and torch applied heat-shrink rubber collar flashing.
- .9 Securement and miscellaneous bolts, nuts and washers: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164 or Type 304 stainless steel with yield strength of 240 MPa (35 Ksi).

2.7 Monorails

SPEC NOTE: Delete items not required.

- .1 Monorails and mounting: designed to carry minimum vertical service load of 4.5 kN (1,000 lbs); fabricated using [aluminum extrusions to CAN3-S157-M83 and CAN3-S244-1969] [Cold rolled hollow steel sections, Type 350W with yield strength of 350 MPa (50 Ksi) and tensile strength of 450 MPa (65 Ksi), galvanized to CSA G164 "Galvanizing, Hot Dip, of Irregularly Shaped Articles"].
- .2 Monorail finish: exterior finish to be [mill] [anodized] [galvanized] [polyester or polyurethane powder coated baked enamel of color as selected from manufacturer's standard colors or custom color]. Interior finish to be [epoxy] [hybrid powder coated] [enamel painted on site].
- .3 Capacity/Data plates: rail entry systems to be equipped with prominently displayed, non-corrosive plate clearly stating Maximum Service Capacity, Manufacturer's name, Serial No. and Manufacturing Date.
- .4 Trolleys: equipped with heavy-duty rollers and 16 mm (5/8") diameter U-bar safety anchors; [exterior finish to be Type 304 stainless steel.] [Interior finish to be powder coated mild steel to match monorail.] Design trolleys to run freely under load with minimum discontinuity at rail splices and provide end stops to ensure trolley cannot become detached from the rail. Stops to be removable for service.
- .5 Safety U-bars: [Type 304 stainless steel with yield strength of 240 MPa (35 Ksi)] [mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164]. U-bar to be not less than 19 mm (3/4") diameter material with 38 mm (1-1/2") eye opening.
- .6 Securement bolts: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164.
- .7 Hollow steel section (HSS) piers: galvanized steel as above with yield strength of 350 MPa (50 Ksi). Wall thickness to suit application.
- .8 Tethers: all pins and loose pieces to be secured using 3 mm (1/8") stainless steel cable complete with easily inserted lead connectors to avoid loss.
- .9 Base plate and all other sections: galvanized mild steel as above with yield strength of 300 MPa (44 Ksi). Thickness and securement to suit application.

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2.8 Climbing Monorails

- .1 Monorails and mounting: designed to carry minimum vertical service load of 4.5 kN (1,000 lbs); fabricated using [aluminum extrusions to ASTM B221-2000 "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes"] [Cold rolled hollow steel sections, Type 350W with yield strength of 350 MPa (50 Ksi) and tensile strength of 450 MPa (65 Ksi), galvanized to CSA G164 "Galvanizing, Hot Dip, of Irregularly Shaped Article"].
- .2 Monorail finish: exterior finish to be [mill] [anodized] [galvanized] [polyester or polyurethane powder coated baked enamel of color as selected from manufacturer's standard colors or custom color]. Interior finish to be [epoxy] [hybrid powder coated] [enamel painted on site].
- .3 Capacity/Data plates: rail entry systems to be equipped with prominently displayed, non-corrosive plate clearly stating Maximum Service Capacity, Manufacturer's name, Serial No. and Manufacturing Date.
- .4 Trolleys: Corrosion resistant and weatherproof electric powered climbing trolleys equipped with heavy-duty rollers and 16 mm (5/8") diameter U-bar safety anchors; [exterior finish to be Type 304 stainless steel.] [Interior finish to be powder coated mild steel to match monorail.] Design trolleys to run freely under load with minimum discontinuity at rail splices and provide end of travel limits to stop traversing upon reaching end of travel to ensure trolley cannot become detached from the rail. Provide locking facility at parking location and to prevent inadvertent movement. Traversing speed to be 6 m/min. (20 ft./min). Stops to be removable for service.
- .5 Drive System: Mechanically positive trolley drive system. Climbing trolleys to be equipped with two power packs employing friction between trolley wheels and the aluminum track. Trolleys to operate safely even on wet or frosty tracks, enabling year round service in most weather conditions. Drive to incorporate safety device to prevent uncontrolled movement down the incline due to failure. Design, fabricate and finish trolleys to ensure no structural or mechanical deterioration over its designed life that could affect security and operation considering permanent exposure to the elements. Provide rotating components with sealed-for-life rolling element bearings protected from the environment.
- .6 Operation: Provide pendant control operable from the [platform] [bosun's chair] including a separate, sufficiently long plug-in pendant control to drive the trolleys to their upper limit when not in use. Controls to be constant pressure type having Forward, Reverse and Emergency Stop buttons.
- .7 Electrical Busbar System: Mount as directed and co-ordinate connection to building power supply with Electrical Division. System to provide power for powered [platform] [bosun's chair] suspended from climbing monorail.
- .8 Automatic Braking System: Provide each trolley with brake to engage whenever power to the trolley is interrupted by controls or power failure. Brakes to be capable of holding trolley on sloped monorail during operation of powered [platform] [bosun's chair]. Equip brakes with overspeed sensor capable of stopping trolley during overspeed or free movement due to failure of drive train system.
- .9 Power supply: co-ordinate location of receptacles with Electrical Division.
- .10 Support brackets: cantilevered brackets of fixing, detail, location and loadings to be co-ordinated and agreed upon. Locate monorail joints as close to brackets as possible and never further than 400 mm (16") away.
- .11 Securement bolts: mild steel, Type 300W with yield strength of 300 Mpa (44 Ksi), hot dipped galvanized to CSA G164.
- .12 Hollow steel section (HSS) piers: galvanized steel as above with yield strength of 350 Mpa (50 Ksi). Wall thickness to suit application.
- .13 Tethers: all pins and loose pieces to be secured using 3 mm (1/8") stainless steel cable complete with easily inserted lead connectors to avoid loss.

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- .14 Base plate and all other sections: galvanized mild steel as above with yield strength of 300 Mpa (44 Ksi). Thickness and securement to suit application.

2.9 Rigging Sleeves

SPEC NOTE: Delete items not required.

- .1 Safety U-bars: [Type 304 stainless steel with yield strength of 240 MPa (35 Ksi)] [mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164]. U-bar to be not less than 19 mm (3/4") diameter material with 38 mm (1-1/2") eye opening.
- .2 Securement Bolts: [mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164] [Type 304 stainless steel with yield strength of 240 MPa (35 Ksi)].
- .3 Straight suspension bars: 19 mm (3/4") diameter mild steel with yield strength of 240 MPa (35 Ksi), hot dipped galvanized to CSA G164.
- .4 Hollow steel section (HSS) sleeves: galvanized mild steel as per 2.9.1 above with yield strength of 350 MPa (50 Ksi) of wall thickness to suit application, and as follows:
 .1 wall mounted rigging sleeves: Fabricate with flip-up hinged door to accommodate push/pull outrigger.
 .2 curved rigging sleeves: Bend with smooth radius finish to protect suspension or safety lines from chafing.
- .5 Hollow steel section (HSS) piers: galvanized steel as above with yield strength of 350 MPa (50 Ksi). Wall thickness to suit application.
- .6 Base plate and all other sections: galvanized mild steel as above with yield strength of 300 MPa (44 Ksi). Thickness and securement to suit application.
- .7 Miscellaneous bolts, nuts and washers: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164 or Type 304 stainless steel with yield strength of 240 MPa (35 Ksi).

2.10 Horizontal Cable Lifeline System

SPEC NOTE: Delete items not required.

- .1 Hollow steel (HSS) pier supports: galvanized mild steel as above with yield strength of 300 MPa (50 Ksi). Wall thickness to suit application.
- .2 Base plate and all other sections: galvanized mild steel as above with yield strength of 300 MPa (44 Ksi). Thickness and securement to suit application.
- .3 Securement bolts: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164.
- .4 Safety U-bars: [Type 304 stainless steel with yield strength of 240 MPa (35 Ksi)] [mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164]. U-bar to be not less than 19 mm (3/4") diameter material with 38 mm (1-1/2") eye opening.

SPEC NOTE: Re 2.10.5. Specify aluminum flashing for BUR or modified bitumen roofs only (membrane above or below insulation). For single ply roofs, flashing must be in accordance with membrane manufacturer's instructions. Specify heat-shrink rubber collar flashing for PBE series roof anchors (BUR or modified bitumen roofs) or s.s. cap for PB series roof anchors (any roof type).

- .5 Seamless spun aluminum flashing (for steel pier supports): Type 6061-T6 alloy to ASTM B221-2000 with deck flange flashed in to recognized roofing standards. Seal top of aluminum flashing with conformable mastic tape and torch applied heat-shrink rubber collar flashing.

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- .6 Miscellaneous bolts, nuts and washers: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164 or Type 304 stainless steel with yield strength of 240 MPa 35 Ksi).

“Hands-Free” Horizontal Lifeline System

SPEC NOTE: The following material clauses are for the “Hands-Free” Horizontal Lifeline System.

- .7 Cable: 8 mm (5/16”) dia., Type 316 stainless steel with minimum breaking strength of 40 kN (9,127 lbs.), complete with permanently swaged cable ends.
- .8 Data Plate: cable system entry points to be equipped with prominently displayed non-corrosive data plate clearly stating Maximum Service Capacity and Number of Users.
- .9 Standard Intermediate support brackets: multi-position Type 316 stainless steel with reinforcing end caps and suitable for installation at any height. Secured using 13 mm (1/2”) dia. fasteners.
- .10 Mobile Intermediate support brackets: multi-position, Type 316 stainless steel for working both sides of sloped roof at ridge point.
- .11 Corner units: manufacturer’s standard 90° or 135° flexible corner units as required.
- .12 End terminal hardware: stainless steel swaged termination at one end and stainless steel tensioner with shock absorber at other end, as required.
- .13 Lanyard cable runner: Type 316 stainless steel with automatic runner bypass for continuous “hands-free” operation that can be inserted or removed anywhere on the cable.
- .14 Harness: manufacturer’s standard “hands-free” full body harness and lanyard complete with shock absorber.

Double Lanyard (DL) Horizontal Lifeline

SPEC NOTE: The following material clauses are for the Double Lanyard (DL) Horizontal Lifeline.

- .7 Cable: 8 mm (5/16”) dia. galvanized steel with minimum breaking strength of 40 kN (9,127 lbs.), complete with matching permanently swaged or mechanically swaged cable ends.
- .8 Data plate: cable system entry points to be equipped with prominently displayed non-corrosive data plate clearly stating Maximum Service Capacity and Number of Users.
- .9 Tensioner: steel turnbuckle, same material as cable.
- .10 Harness: manufacturer’s standard full body harness with double lanyard and shock absorbers.

2.11 Horizontal Trolley Rail System

SPEC NOTE: Delete items not required.

- .1 Horizontal rails and mounting: designed to carry minimum vertical service load of 4.5 kN (1,000 lbs); fabricated using [aluminum extrusions to “Standard Specifications for Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes”] [Cold rolled steel sections, Type 300W with yield strength of 300 MPa (44 Ksi) and tensile strength of 450 MPa (65 Ksi), galvanized to CSA G164. Provide end stops to ensure trolleys cannot become detached from the rail. Stops to be removable for service.
- .2 Monorail finish: exterior finish to be [mill] [anodized] [galvanized] [polyester or polyurethane powder coated baked enamel of color as selected from manufacturer’s standard color or custom color]. Interior finish to be [epoxy] [hybrid powder coated] [enamel painted on site].

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- .3 Capacity/ Data plates: rail entry systems to be equipped with prominently displayed, non-corrosive plate clearly stating Maximum Service Capacity, Manufacturers name, Serial No. and Manufacturing Date.
- .4 Trolleys: equipped with heavy duty rollers and 16 mm (5/8") diameter U-bar safety anchors; [exterior finish to be Type 304 stainless steel]. Design trolleys to run freely under load with minimum manipulation.
- .5 Safety U-bars: [Type 304 stainless steel with yield strength of 240 MPa (35 Ksi)] [mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164]. U-bar to be not less than 19 mm (3/4") diameter material with 38 mm (1-1/2") eye opening.
- .6 Securement bolts: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164.
- .7 Hollow steel section (HSS) piers: galvanized steel as above with yield strength of 300 Mpa (50 Ksi). Wall thickness to suit application.
- .8 Tethers: All pins and loose pieces to be secured using 3 mm (1/8") stainless steel cable complete with easily inserted lead connectors to avoid loss.
- .9 Base plate and all other sections: galvanized mild steel as above with yield strength of 300 MPa (44 Ksi). Thickness and securement to suit application.

SPEC NOTE: Re 2.11,10. Specify aluminum flashing for BUR or modified bitumen roofs only (membrane above or below insulation). For single ply roofs, flashing to be in accordance with membrane manufacturer's instructions.

- .10 Seamless spun aluminum flashing (for roof mounted steel pier anchors): Type 6061-T6 alloy to ASTM B221-2000 with deck flange flashed in to recognized roofing standards. Seal top of aluminum flashing with conformable mastic tape and torch applied heat-shrink rubber collar flashing.
- .11 Miscellaneous bolts, nuts, and washers: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164 or Type 304 stainless steel with yield strength of 240 MPa (35 Ksi).

2.12 Permanent Powered Platforms/Gondolas

SPEC NOTE: Delete items not required.

SPEC NOTE: Equipment supports and the structure to which they are attached must be designed to support the rated working load which is the combined static weight of the workers, materials, and the total weight of the suspended permanent powered platform/gondola. Generally the support equipment is designed to support this increased weight. The reactions will have to be adjusted for supports (davits, monorails, outriggers, etc.) to reflect the increased loads. Contact Pro-Bel for requirements.

- .1 Suspended platform/gondola: Type 6061-T6 aluminum alloy to ASTM B221-2000 mill and powder coated finished modular platform/gondola system to ASME A120.1-2001, of engineered length and width to suit application based on load bearing frame, with non-slip, aluminum deck, soft rubber wall rollers and caster wheels. [Provide integral, detachable 915 mm (3'-0") long single work cage at one end complete with all necessary appurtenances for the use intended.]
- .2 Frame and rails: side frames and connecting frames to be structural aluminum, galvanized mild steel or powder coated steel; guard rails and guard rails posts to be square, thick wall aluminum extrusions with rails a minimum of 915 mm (36") above deck level at working side of platform/gondola and 1067 mm (42") at non-working side. A 90 mm (3-1/2") high toe-board to be provided around circumference of platform/gondola with spaces between toe-board and guardrails covered with expanded aluminum screen, excluding front of platform/gondola between mid-rail and top rail.

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- .3 Stirrups: structural aluminum, hot dipped galvanized steel or powder coated steel fitted with manufacturer's standard hoist unit, top limit switch assembly and striker plate, and high "fair lead".
- .4 Wire winders: [electric powered] [passive type] with single or twin drum built into stirrups, to allow drums to wind evenly to prevent loose wires and jamming; capacity and dimension to suit application.
- .5 Cable storage bin: fitted to rear guard rail, capacity and dimensions to suit application.
- .6 Upper limit switch assembly: fitted on top of each stirrup, designed to cut electric power supply to hoist when switch contacts striker plate on suspension rope at top limit of travel.
- .7 Electro mechanical overload system: integral with each hoist preset to safe working load plus 25%, designed to operate limit switch and cut power supply if overloading of platform/gondola should occur.
- .8 Lower limit trip bar assembly: consisting of hinged aluminum bar at each end of underside of working face of platform/gondola, designed to operate limit switch and interrupt electric power supply to both hoists in the event bar is pushed upwards by any obstruction on the building facade during descent, but still allowing platform/gondola to be operated in upward direction.
- .9 Main and auxiliary control boxes: electric control gear for both hoists and wire winder motors contained in central control box and mounted to rear guardrail. Standard layout to contain:
 - .1 UP/DOWN "HOLD TO RUN" push buttons for both hoists;
 - .2 hoist selector switch LEFT/RIGHT/BOTH (optional);
 - .3 bottom trip bar over-ride button;
 - .4 emergency stop button;
 - .5 platform/gondola self-leveling system;
 - .6 power on indicator light;
 - .7 three phase protection and indicator lights;
 - .8 locking facility on main switch;
 - .9 hand wheel for manual hoist operation;
 - .10 watertight electrical "quick" connections.
- .10 Hoist unit: platform/gondola to be powered by two UL listed traction type hoists with the following features:
 - .1 30 amp 230 volt 60 Hertz hoist with lift capacity to suit platform/gondola weight and live load.
 - .2 10.7 m/min. (35 ft./minute) speed;
 - .3 slack rope safety device acting on safety rope;
 - .4 electro mechanical overload system;
 - .5 electro mechanical main brake;
 - .6 "no power" controlled emergency descent system;
 - .7 hoist protection cover (optional).

SPEC NOTE: Re 2.12.11. Specify four wire ropes for buildings over 91.4 m (300'-0"). If two wire ropes are specified, separate lifeline anchors are required for workers. See Pro-Bel Safety & Tie-back Anchors literature.

- .11 Steel wire rope: platform/gondola to be supplied complete with [two] [four] galvanized high tensile steel wire ropes of length as required. Each rope to be fitted with 1.4 kg (3 lb.) safety hook with thimble talurit clamp and a brazed "bullet-end". Construction 6 x 19 Seale & IWRC, standard diameter 8 mm (5/16").
- .12 Electrical supply cable: trailing supply cable to be fitted with male CEE plug for connection to the central control box and supplied with cable support clamp, length as required. Power cords for buildings over 107 m (350'-0") to be equipped with reinforced core.
- .13 Portable fire extinguisher: to be securely attached to platform/gondola.
- .14 Accessories (Optional):
 - .1 water container fitted at rear guard rail;

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.2 tool-outlet fitted on central control box.

- .15 Powder coated finish: treatment to consist of steel sandblasted to SA3 requirement, metalized hot zinc sprayed (thread quality dia. 3.8 mm Zn-Al 850, coating thickness 40 microns), and standard blue powder coating (polyester PR 31-TR 5015 HR-58-200-F, coating thickness 60 to 80 microns).

2.13 Single Work Cage

- .1 Suspended platform: Type 6061-T6 aluminum alloy mill finished modular platform system to ASME A120.1-2001, of engineered 1 m (3'-0") length and width to suit application based on load bearing frame, with non-slip, aluminum deck, soft rubber wall rollers and caster wheels.
- .2 Frame and rails: side frames and connecting frames to be structural aluminum or galvanized mild steel; guard rails and guard rails posts to be square, thick wall aluminum extrusions with rails a minimum of 915 mm (36") above deck level at working side of platform and 1067 mm (42") at non-working side. A 90 mm (3-1/2") high toe board to be provided around circumference of platform with spaces between toe-board and guardrails covered with expanded aluminum screen, excluding front of platform between mid-rail and top rail.
- .3 Stirrup: structural aluminum or hot-dip galvanized steel fitted with manufacturer's standard hoist unit, top limit switch assembly and striker plate, and high "fair lead".
- .4 Wire winder: [electric powered] [passive type] with single or twin drum built into stirrup, to allow drums to wind evenly to prevent loose wires and jamming; capacity and dimension to suit application.
- .5 Cable storage bin: fitted to rear guard rail, capacity and dimensions to suit application.
- .6 Upper limit switch assembly: fitted on top of each stirrup, designed to cut electric power supply to hoist when switch contacts striker plate on suspension rope at top limit of travel.
- .7 Electro mechanical overload system: integral with each hoist preset to safe working load plus 25%, designed to operate limit switch and cut power supply if overloading of platform should occur.
- .8 Lower limit trip bar assembly: consisting of hinged aluminum bar at underside of working face of platform, designed to operate limit switch and interrupt electric power supply to hoist in the event bar is pushed upwards by any obstruction on the building facade during descent, but still allowing platform to be operated in upward direction.
- .9 Main and auxiliary control boxes: electric control gear for hoist and wire winder motor contained in central control box and mounted to rear guardrail. Standard layout to contain:
- .1 UP/DOWN "HOLD TO RUN" push buttons for hoist;
 - .2 bottom trip bar over-ride button;
 - .3 emergency stop button;
 - .4 power on indicator light;
 - .5 three phase protection and light indicator;
 - .6 locking facility on main switch;
 - .7 hand wheel for manual hoist operation;
 - .8 watertight electrical "quick" connections.
- .10 Hoist unit: platform to be powered by UL listed traction type hoist with the following features:
- 30 amp 230 volt 60 Hertz hoist with lift capacity to suit platform weight and live load.
 - .1 10.7 m/min. (35 foot/minute) speed;
 - .2 slack rope safety device acting on safety rope;
 - .3 electro mechanical overload system;
 - .4 electro mechanical main brake;
 - .5 "no power" controlled emergency descent system;
 - .6 hoist protection cover (optional).

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- .11 Steel wire rope: platform to be supplied complete with two galvanized high tensile steel wire ropes of length as required. Each rope to be fitted with 1.4 kg (3 lb). safety hook with thimble talurit clamp and a brazed "bullet-end". Construction 6 x 19 Seale & IWRC, standard diameter 8 mm (5/16").
- .12 Electrical supply cable: trailing supply cable to be fitted with male CEE plug for connection to the central control box and supplied with cable support clamp, length as required. Power cords for buildings over 107 m (350'-0") to be equipped with reinforced core.
- .13 Portable fire extinguisher: to be securely attached to platform.
- .14 Accessories (Optional):
 - .1 water container fitted at rear guard rail;
 - .2 tool-outlet fitted on central control box.

2.14 Motorized Bosun's Chair

- .1 Chair: Model H400E with framework manufactured using high quality structural steel and shot blasted powder coated blue finish.
- .2 Standard components: H400 traction hoist, Type 3 overspeed safety brake and bracket, overload assembly, top limit switch, wall rollers, caster wheels, safety belt, powered twin wire reeler assembly, water buckets and holders, adjustable foot support, and control station.
- .3 Portability: upper frame to be foldable and water buckets/holders to be removable for passing through doorways.
- .4 Overall dimensions: 1285 mm (4'-3") long x 1132 mm (3'-9") wide x 1810 mm (5'-11") high.
- .5 Rated load: one man, 90 kg (200 lbs.).
- .6 Suspension: galvanized steel wire ropes, 8.3 mm (3/8") dia. TR 17 having tensile strength of 1960 n/mm² (284,000 psi). Actual breaking load of wire rope is 48 kN (5.395 ton-force).
- .7 Hoist, capacity, and speed: Model H400; 400 kg (882 lbs.); 8.5 m/min. (28 ft./min).
- .8 Power supply: 220/240 volts, single phase or 380/440 volts, three phase. Control voltage, 24 volts AC.
- .9 Reeler capacity: 40 meters (131 feet).
- .10 Weight (without wires, electrical cable and rated load): 168 kg (370 lbs.).

2.15 Permanent Powered Platform/Gondola Stabilization (Tie-In Guides)

SPEC NOTE: The following clauses are written for inclusion at the end of Part 2, the materials section of a Pro-Bel Permanent Powered Platform/Gondola specification. It is recommended that all buildings more than 40 m (130'-0") in height employing a permanent installation has either a continuous stabilization system (mullion tracks), or an intermittent stabilization system (buttons or detent pins) at every third floor or 15.3 m (50'-0") whichever is less, to protect workers against high winds.

SPEC NOTE: Re 1. Below. Ensure strict co-ordination between mullion manufacturer and suspended access equipment manufacturer to avoid joint alignment problems. In curtain wall specification, specify the exterior of the building is to be designed to provide a positive and continuous means of engagement between the suspended platform/gondola and the building during full vertical travel of the platform/gondola on the face of the building. Tie-in guide dimensions for internal track to be minimum 25 mm (1") opening with minimum inside dimensions of 64 mm wide X 64 mm deep (2-1/2"

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wide by 2-1/2" deep). Cope out or design tracks so that platform/gondola trolleys can be inserted at both top and bottom of building.

.1 Continuous Stabilization: Provide guide roller/sliding shoe assembly at each end of bottom platform/gondola designed to provide continuous engagement between platform/gondola and internal tracks. Co-ordinate design with curtain wall manufacturer to ensure smooth operation.

.2 Intermittent Stabilization Anchors:

.1 Buttons: Locate buttons every third floor or 15.3 m (50'-0") whichever is less, in line with platform/gondola suspension points. Buttons to be Pro-Bel stainless steel or other corrosion resistant material 38 mm dia. X 5 mm thickness (1-1/2" dia. X 3/16" thickness) with Allen head recess, complete with threaded s.s. building anchor insert of size and configuration to suit building facade and sufficient quantity adjustable s.s. stabilizer ties. The design load for stabilization components such as tie-in guides/buttons/detent pins are designed for a working load of 1.33 kN (300 lbs) as per AISC requirements and/or other applicable codes and to 2.67 kN (600 lbs) against fracture or detachment. Bolts and any other connecting hardware to be made of stainless steel or hot dipped galvanized steel.

SPEC NOTE: Re 2. below. Specify detent pins only where flush building appearance is critical.

.2 Detent Pins: Locate detent pin inserts every third floor or 15.3 m (50'-0") whichever is less in line with platform/gondola suspension points. Detent pins to be Pro-Bel stainless steel or other corrosion resistant material 8 mm or 10 mm (5/16" or 3/8" dia.) tie handles with spring loaded ball lock, to suit building facade; include sufficient quantity adjustable s.s. stabilizer ties. The design load for stabilization components such as tie-in guides/buttons/detent pins are designed for a working load of 1.33 kN (300 lbs) as per AISC requirements and/or other applicable codes and to 2.67 kN (600 lbs) against fracture or detachment. Bolts and other connecting hardware to be made of stainless steel or hot dipped galvanized steel.

2.16 Non-Permanent (Temporary) Platform/Gondola Stabilization (Tie-In Guides)

SPEC NOTE: The following clauses are written for inclusion at the end of the "Materials" section of a Pro-Bel Davit Systems or Outrigger Beam Systems specification. It is recommended that all buildings more than 40 m (130'-0") in height is designed with a stabilization system, to protect workers against high winds.

.1 Intermittent Stabilization Anchors:

.1 Buttons: Locate buttons at every floor level except for the bottom three floors in line with platform/gondola suspension points. Buttons to be Pro-Bel stainless steel or other corrosion resistant material 38 mm dia. X 5 mm (1-1/2" diameter. X 3/16" thickness) with Allen head recess, complete with threaded s.s. building anchor of size and configuration to suit building facade and sufficient quantity adjustable s.s. stabilizer ties. The design load for stabilization components such as tie-in guides/buttons/detent pins are designed for a working load of 1.33 kN (300 lbs) as per AISC requirements and/or other applicable codes and to 2.67 kN (600 lbs) against fracture or detachment. Bolts and any other connecting hardware to be made of stainless steel or hot dipped galvanized steel.

SPEC NOTE: Re 2. below. Specify detent pins only where flush building appearance is critical as pin holes are not as easy to locate as buttons during maintenance operations.

.2 Detent Pins: Locate detent pins at every floor level except for the bottom three floors in line with platform/gondola suspension points. Detent pins to be Pro-Bel s.s. or other corrosion resistant material 8 mm or 10 mm X 50 mm long (5/16" or 3/8" dia. X 2" long) tie handle with spring loaded ball lock, quantity to suit. The design load for stabilization components such as tie-in guides/buttons/detent pins are designed for a working load of 1.33 kN (300 lbs) as per AISC requirements and/or other applicable codes and to 2.67 kN (600 lbs) against fracture or detachment. Bolts and other connecting hardware to be made of stainless steel or hot dipped galvanized steel.

SPEC NOTE: If the building has been designed with davit bases to suit roof rigged davit arms, locate buttons/detent pins every third floor or 15.3 m (50'-0") whichever is less in line with davit base suspension points.

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2.17 Powered Davit Carriages

- .1 Carriages: electric powered, mounted on horizontal rails, with two-piece tip-up davit arm system operating on trolleys which is raised and lowered using a portable winch. Davit arms are to be capable of being locked into position.
- .2 Traversing speed: the maximum rated speed at which the powered davit carriages may be moved in a horizontal direction is to be 12 m (39'-4")/minute.
- .3 Controls: locate operating devices on the carriages, the working platform, or both. Controls to be of continuous pressure weatherproof electric type. If more than one operating device is provided, arrange devices so that simultaneous traversing of both carriages is possible for only one operating device at a time. Controls to be accessible from the suspended platform. Connect controls so that carriages do not operate until:
 1. The platform is located at the uppermost position of travel and is not in contact with the building face or the fixed vertical stabilizer guides located on the face of the building, and at its innermost position on the davit arms.
 2. All protective devices and interlocks are in a position for traversing.
- .4 Stability factor: to be calculated or proven by test while considering the suspended platform in its most outboard positions for traversing, operating and storage. System stability to be obtained by attachment to structural supports and track system, as follows:
 1. For horizontal traversing, consider a 0.479 KPa (10 psf) wind load applied to the equipment. Stability factor to be not less than 4 to 1 including the effects of impact.
 2. Equipment to be capable of withstanding the highest wind velocities expected for the area in which the equipment is located, when the equipment is in a non-use or stored position. Maximum wind velocity used is to be 161 km/h (100 mph).
- .5 Auto brakes: provide automatically applied braking system to prevent unintentional traversing of the powered davits.
- .6 Key lock-out: provide key lock-out for power supply on davit carriages to prevent unauthorized use.
- .7 Safety guards: provide enclosures or guards to prevent accidental personnel contact with moving parts or pinch points.
- .8 Interlocks: provide devices on carriages and power cord reel to prevent any undue strain on power cord and to prevent cord from being trapped between the carriage wheels and tracks.
- .9 Track works: mild steel, Type 350W with yield strength of 50 Ksi (350 MPa) hot dip galvanized to CSA G164. Tracks to be straight, true and level, with a step deviation of less than 3 mm (1/8").
- .10 Work station markings: identify each work station location by markings on tracks and/or indexing vanes and positioning switches.

2.18 Manually Operated Davit Carriages

- .1 Carriages: mounted on horizontal rails, with two-piece tip-up davit arm system operating on trolleys which is raised and lowered using a portable winch. Davit arms are to be capable of being locked into position.
- .2 Stability factor: to be calculated or proven by test while considering the suspended platform in its most outboard positions for traversing, operating and storage. System stability to be obtained by attachment to structural supports and track system, as follows:
 1. For horizontal traversing, consider a 0.479 KPa (10 psf) wind load applied to the equipment. Stability factor to be not less than 4 to 1 including the effects of impact.
 2. Equipment to be capable of withstanding the highest wind velocities expected for the area in which the equipment is located, when the equipment is in a non-use or stored position. Maximum wind velocity used is to be 161 km/h (100 mph).

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- .3 Safety guards: provide enclosures or guards to prevent accidental personnel contact with moving parts or pinch points.
- .4 Track works: mild steel, Type 350W with yield strength of 50 Ksi (350 MPa) hot dip galvanized to CSA G164. Tracks to be straight, true and level, with a step deviation of less than 3 mm (1/8”).
- .5 Work station markings: identify each work station location by markings on tracks.

2.19 Traveling Gantry

- .1 Operation: [Manually operated][electric powered] to suit profile of [interior][exterior] atrium.
- .2 Gantry platform: Type 6061-T6 mill finished aluminum alloy to ASTM B221-2000 modular platform system to ASME A120.1-2001, of engineered length and width to suit application, based on load bearing frame with non-slip aluminum deck and rated for two-man operation. Design to ensure that gantry will not rack or twist during use. Platform to have locking facility at each workstation and in parking location. System entry points to be equipped with prominently displayed, non-corrosive data plate clearly stating maximum service capacity.
- .3 Guardrails: side frames and connecting frames to be structural aluminum or galvanized mild steel; guardrails to be square, thick wall aluminum extrusions with rails a minimum of 1067 mm (42”) above deck level and typically equipped with either localized stainless steel fall protection anchors or a “dogline” for securing lifelines, and spring loaded, sliding/retractable gates, where applicable.
- .4 Pipe or I-beam monorail tracks: [Type 6061-T6 mill finished aluminum alloy, fabricated to “Standard Specifications for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes”].[mild steel, Type 350W with yield strength of 350 MPa (50 Ksi), hot dip galvanized to CSA G164.] Tracks to run horizontally and be straight, true and level, with a step deviation of less than 3 mm (1/8”).
- .5 Large diameter wheels: nickel cadmium plated steel or stainless steel complete with sealed ball bearings.
- .6 Monorail supports, plate and all other sections: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164.
- .7 Interior trolleys: Type 304 stainless steel or powder coated mild steel with heavy-duty rollers. Designed for straight or radiused rails. Provide means for servicing, repair or replacement of trolleys as necessary.
- .8 Safety Guards: provide enclosures or guards to prevent accidental personnel contact with moving parts or pinch points.
- .9 Securement bolts: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164.
- .10 Miscellaneous bolts, nuts and washers: mild steel, Type 300W with yield strength of 300 MPa (44 Ksi), hot dipped galvanized to CSA G164 or Type 304 stainless steel with yield strength of 240 MPa (35 Ksi).
- .11 Controls: for electric powered gantries, locate operating devices on working platform. Controls to be of continuous pressure weatherproof electric type. Provide key lockout for power supply to prevent unauthorized use and automatically applied braking system to prevent unintentional traversing of platform.
- .12 Traversing speed: the maximum rated speed at which powered gantries may be moved in a horizontal direction is to be 12 m (39’-4”) / minute.
- .13 Manual operation: geared crank handle, mild steel hot dipped galvanized to CSA G164.

2.20 Rolling ladders

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- .1 Ladder: designed to support two workers at 113 kg (250 lbs.) load each; fabricated using aluminum extrusions to ASTM B221-2000 "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .2 Ladder Finish: exterior finish to be [mill] [clear anodized] [polyester or polyurethane powder coated baked enamel of color as selected from manufacturer's standard colors or custom color].
- .3 Size: 686 mm (2'-3") nominal width x 762 mm (2'-6") nominal depth with step rungs serrated for grip without discomfort to hand, and guardrails 915 mm (3'-0") high.
- .4 Brakes: spring release type for positioning ladder at work location or parking and locking at the end of the building elevation to prevent inadvertent movement due to wind.
- .5 Fall protection: continuous fall arrest system on both sides of ladder.
- .6 Clearance: position ladder parallel to building elevation with 305 mm (12") clearance between rear side of ladder and building facade which is to be maintained by the roller guides at the ends of the ladder.
- .7 Pipe or I-beam tracks: [Type 6061-T6 mill finished aluminum alloy, fabricated to "Standard Specifications for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes".][mild steel, Type 350W with yield strength of 350 MPa (50 Ksi), hot dip galvanized to CSA G164.] Tracks to run horizontally and be straight, true and level, with a step deviation of less than 3 mm (1/8").
- .8 Operation: provide for manual traversing of ladder using a force not to exceed 50 Newtons (11.2 pound-force).
- .9 Guide rollers: adjustable, anti-crabbing and anti-lift type acting on the top track to locate and guide the ladder along the elevation. Flanged support rollers not acceptable. All rotating components to have sealed for life rolling element bearings protected from the environment.
- .10 Safe access: provide safe access to ladder(s) via a horizontal lifeline or other means of fall protection.

2.21 Powered Roof Car

SPEC NOTE: A roof car should be provided whenever it is necessary to move a working platform horizontally to a working or storage position.

SPEC NOTE: Select Model of roof car required from below. Delete items not required.

- .1 Roof Car: electric powered Pro-Bel Model PT 3008 Fully Balanced Trackless Trolley supported on hard rubber tired wheels operating on a reinforced concrete bearing or similar surface cast on top of the roof finish. Roof trolley to be guided by an L-shaped steel angle fixed to the concrete runway. Steel base frame and suspension jib to have 360° slewing (rotating) and luffing (up and down) capability.]

Roof Car: electric powered Pro-Bel Model FS-3000 Free Standing Trolley fully balanced roof car on freestanding track system operating on twin galvanized I-beam track system supported on galvanized steel crossbeams over support foot assemblies bearing on reinforced concrete pads or sleepers bedded on top of the roof finish. Weight balance ratio to be as per authorities having jurisdiction. Steel base frame and suspension jib to have luffing (up and down) capability.]

Roof Car: electric powered Pro-Bel Model RA-3004 Roof Anchored Trolley with trolleys supported on four wheel assemblies operating on galvanized track mounted on concrete piers or crossrails cast into the roof slab. Steel base frame and suspension jib to have 360° slewing (rotating) and luffing (up and down) capability.]

Roof Car: electric powered Pro-Bel Model RA 3006 Roof Anchor Trolley with Jib End Pantograph Assembly. Trolleys to be supported on four wheel assemblies operating on galvanized track mounted on concrete piers or

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crossrails cast into the roof slab. Steel base frame and suspension jib to have 360° slewing (rotating) and luffing (up and down) capability. Pantograph assembly to always remain horizontal whatever the inclination of the jib. Connecting upper turret to allow platform to be rotated 90° to provide added platform access.]

SPEC NOTE: Model RA 3006 Roof Car above also available with telescoping jib if desired.

[Roof Car: electric powered Pro-Bel Model RA-T09 Roof Anchored Trolley with Short Single Telescopic Jib. Trolleys to be supported on four wheel assemblies operating on galvanized tracks mounted on concrete piers or crossrails cast into the roof slab. Steel base frame and telescopic suspension jib to have 85° slewing (rotating) capability in each direction. Connecting upper turret assembly on the jib end to allow platform to be rotated 90° to provide added platform access.]

[Roof Car: electric powered Pro-Bel Model RA/22.5 Special Type/Long Reach. Trolleys to be supported on four wheel assemblies operating on galvanized track mounted on concrete piers cast into the roof slab. Steel base frame and long reach suspension jib to have 360° slewing (rotating) capability and luffing (up and down) capability. Pantograph assembly to always remain horizontal whatever the inclination of the jib. Connecting upper turret and suspension beam assembly to allow platform to be rotated 180° to provide added platform access.]

[Roof Car: electric powered Pro-Bel Model WA 3007 Parapet Mounted with Twin Track Trolley and Single Jib, supported on four wheel assemblies operating on a galvanized lower I-beam and upper galvanized steel channel track, all mounted onto a structural parapet wall. Steel base frame and suspension jib to have 360° slewing (rotating) and luffing (up and down) capability.]

- .2 Platform: 2.7 metre (6'-10-1/4") length, Type 6061-T6 aluminum alloy to ASTM B221-2000, mill finished with stirrups hot zinc sprayed and powder coated, to ASME A120.1-2001, of width to suit application, based on load bearing frame, with non-slip aluminum deck, soft rubber wall rollers and caster wheels. Suspension system to consist of two primary wire ropes and two safety wire ropes operating at a hoist speed of 29'-6" (9 m)/minute and designed for horizontal travel, with a traversing speed of 39'-4" (12 m)/minute.
- .3 Roof trolley: steel fabrication, shot blasted, hot zinc sprayed and powder coated blue.
- .4 Lower base frame assembly: robust design fabricated from heavy duty steel box section with bearing housings to be incorporated in the frame for the wheel units together with attachment points for the slewing assembly.

SPEC NOTE: Re 2.03, .5 and .6. Hydraulic cylinder is optional.

- .5 Upper base frame assemblies: robust design fabricated from heavy duty steel box sections. [Attached points for the hydraulic cylinder jib assembly to be provided.]
- .6 Jib assembly: fabricated from heavy duty steel box section [with attachment points for the hydraulic cylinder which allows the jib assembly to be luffed from the maximum to minimum working positions as shown on the drawings. Jib luffing speed to be 3 m (10'-0")/minute. Standard forward reach to be [5'-0" (1500 mm)].

SPEC NOTE: Re 2.03 .7. Slewing bearing at end of jib arm can be incorporated (optional).

- .7 Slewing bearing: incorporate at end of jib arm.
- .8 Slewing assembly: precision manufactured slewing bearing attached to upper and lower base frame; provide 360° powered rotation by means of electric geared motor transmission controlled by push buttons from either control station. Slewing speed to be 0.5 rpm.

SPEC NOTE: Re 2.03,0. Luffing assembly is optional.

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- .9 Luffing assembly: heavy duty double acting hydraulic cylinder with electrically operated power pack consisting of hydraulic tank, filter, pressure relief valve, motorized pump unit and solenoid operated directional control valves. System working pressure to be between 8274/10 342 kPa (1200/1500 psi). For added safety, fit an Anti-Pipe Burst valve to base of hydraulic cylinder to lower the jib assembly at a controlled rate in the event of an hydraulic pipe failure. Incorporate hydraulic power pack within the trolley base frame.
- .10 Supply cable reeling drum: fit roof trolley with spring loaded 20 m (65'-0") capacity reeling drum to automatically reel in or out the electrical power supply cable between the roof power sockets and the roof trolley.
- .11 Controls: provide the following:
- .1 On/Off control of the power supply by means of key operated switch mounted on the trolley to prevent unauthorized use of the unit.
 - .2 Provide an additional key operated selector switch to permit control of the traversing operations at either the push button control station mounted on the trolley, or alternatively, to the push button pendant control suspended from the jib head. All push buttons to be continuous finger pressure type to operate the functions with "emergency stop" push buttons at all control positions.
 - .3 House main electrical control panel in key secured weatherproof compartment on rear of base frame. Provide ground protection unit within panel.
 - .4 Provide power to platform via electrical power supply cable attached to the roof trolley jib head. Store cable inside storage compartment fitted on platform. Achieve raising and lowering of platform by manual operation of the push button on the platform central control unit.
 - .5 If more than one operating device is provided, arrange devices so that traversing is possible for only one operating device at a time. Connect controls so that roof car does not operate until:
 - a. The platform is located at its uppermost position of travel and is not in contact with the building face or the fixed vertical stabilizer guides located on the face of the building.
 - b. All protective devices and interlocks are in a position for traversing.
- .12 Stability: provide continuously stable roof car, considering overturning moment as determined by 125% rated load, plus maximum dead load and the prescribed wind loading.
- .13 Roof car access: provide safe access to the roof car and from the roof car to the working platform.
- .14 Storage: when required, make provisions to secure the roof car in the stored position using tie-down anchors. Cars subject to wind forces to be stored in accordance with the requirements of ASME A120.1-2001.
- .15 Track works: mild steel, Type 350W with yield strength of 50 Ksi (350 MPa) hot dip galvanized to CSA G164. Tracks to be straight, true and level, with a step deviation of less than 3 mm (1/8").

SPEC NOTE: Refer to Pro-Bel Stabilization Systems literature for platform stabilization options.

- .16 Stabilization:

PART 3- EXECUTION

3.1 Examination

- .1 Examine surfaces and areas upon which the work of this section depends. Report to the Contractor in writing, defects of work prepared by other trades and other unsatisfactory site conditions, which would cause defective installation of products, or cause latent defects in workmanship and function.
- .2 Verify site dimensions.
- .3 Commencement of work will imply acceptance of prepared work.

3.2 Installation

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- .1 Install equipment in accordance with approved shop drawings and manufacturer's recommendations.
- .2 Co-ordinate installation with work of related trades.
- .3 Install all work true, level, tightly fitted and flush with adjacent surfaces as required.
- .4 Deform threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal or vandalism.

SPEC NOTE: Re 3.2.5. Specify for furnish only projects if required.

- .5 Manufacturer or manufacturer's representative to assist and/or supervise installation of window cleaning/suspended maintenance equipment installed by others.
- .6 Structural steel to receive safety anchors to have adequate bearing surface as indicated on shop drawings and/or to ensure 100% weld.

3.3 Final Adjusting and Inspection

- .1 Adjust and leave equipment in proper working order.
- .2 Complete "Initial Inspection – Certification for Use" form included in Equipment Manual & Inspection Log Book.

3.4 Testing

- .1 All anchors relying upon chemical adhesive fasteners to be 100% tested on site using load cell test apparatus in accordance with manufacturer's recommendations.

End of Section