



# RIGGING SLEEVE SYSTEMS

### DESCRIPTION

Rigging sleeves are primarily a redirection system that allows maintenance platform suspension lines and/or lifelines to be re-routed or fished through pipe sleeves. They can be any length or shape as well as adapted to suit virtually any building condition.

Sometimes it is not possible to rig primary suspension lines or worker lifelines over a parapet, roof edge, balcony or similar building element. The only option available is to go *through* it.

Pro-Bel rigging sleeves have solved many a window cleaning access problem by providing pathways through roofs, floors, and walls or other inaccessible elements for suspension lines where access would otherwise be difficult, unsafe or impossible.

Typically, workers access rigging sleeves located at upper levels via the roof, balcony, mechanical room floor, or soffit. They then suspend their lines through the sleeves and return to the first floor or lower level to ground rig their platform.

There are literally dozens of Pro-Bel rigging sleeve products available. Each has been engineered to satisfy a particular job requirement. They can be categorized as follows:

- roof mounted rigging sleeves complete with rigging bars and removable cap;
- wall mounted rigging sleeves complete with push/pull portable anchors;
- floor mounted rigging sleeves complete with flush-type rigging cap plate;
- curved rigging sleeves c/w rigging bars and support bases.

### USE

For safe, convenient access of primary suspension lines or lifelines *through* roof, floor, wall or other building elements.

Ideal for accessing sloped roofs, overhangs, skylights or otherwise inaccessible areas.

Also recommended when all other conventional means of performing window cleaning/suspended maintenance cannot be used.

Suitable for use with platform, single work cage or bosun's chair with *ascending* capability.



The two construction photos above show a curved horizontal rigging sleeve anchored behind a screen wall on the roof and passing through both the wall and a soffit roof. At rear of sleeve a primary line and lifeline are typically shackled to the two straight bars.



Curved Horizontal Rigging Sleeve Illustration

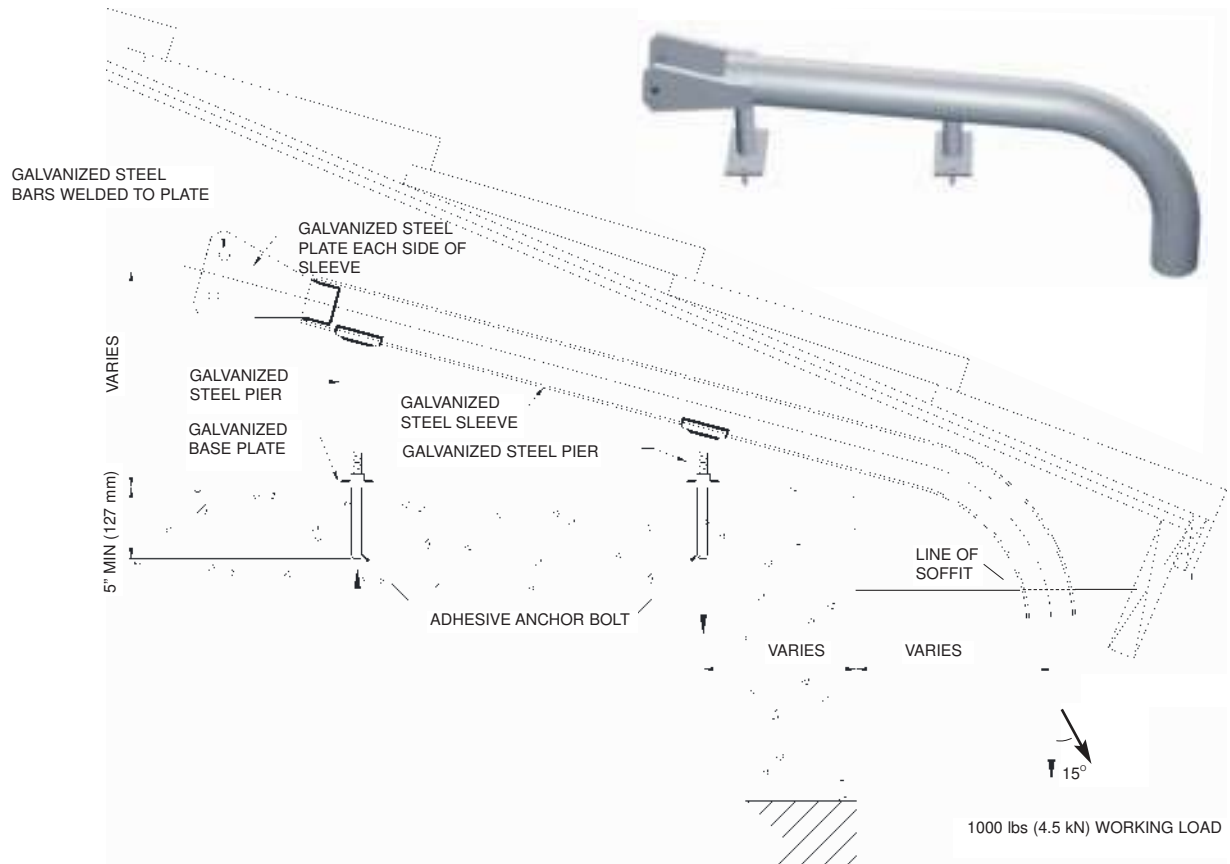
### Application

For facilitating passage of primary suspension lines and lifelines through wall or other horizontal application. Typical locations include overhanging soffit below sloped roof and similar applications. Curved round steel rigging sleeve outlet provides required clearance with face of window or other type wall i.e. 24" (610 mm). Primary line is shackled onto one straight bar at back of sleeve while lifeline is shackled onto other straight bar or U-bar safety anchor.

Securement methods include cast-in-place, bolt through, bolt around, chemical adhesive, welding and/or mounting to steel pedestal reinforcing (can be flashed for exterior applications). Sleeve in art illustration can be fabricated to suit virtually any horizontal condition.

Rigging sleeves are available in horizontal, curved, or vertical configuration and can be designed to suit any structure for both retrofit and new construction.

# Primary Suspension Equipment



**SECTION DETAIL – PRO-BEL CURVED RIGGING SLEEVE (MODEL# RSC7-6200)**



Curved rigging sleeves projecting from soffit (circled areas) are used to provide suspension points for platform and worker lifelines for window cleaning of non-balcony windows. Grand Bay Residences, Key Biscayne, Florida.



### FEATURES

**All corrosion resistant materials;** rigging sleeve components are stainless steel and hot-dip galvanized steel.

**Standards conformance;** all rigging sleeve anchors comply with OSHA and ASME/ANSI/IWCA safety requirements for window cleaning, and various materials standards.

**Installation flexibility;** Pro-Bel rigging sleeves are suited to a broad range of building structures, including concrete, structural steel or precast panels. Securement methods include cast-in-place, through bolts, bolt around, welding, or chemical adhesive fastening.

**Engineer certified;** OSHA requires that rigging sleeves and related safety anchors be designed by or under the direction of a registered professional engineer experienced in such design. Pro-Bel rigging sleeve performance is based on data derived from independent testing and/or engineering calculations. Sleeves are rated for minimum 1,000 lb. (4.5 kN) vertical service load.

**Compatible with roofing;** an important consideration in the design of Pro-Bel roof mounted rigging sleeves is the need to maintain the long term watertight

integrity of the building. Pro-Bel products are designed with a full understanding of reliable flashing/sealing techniques to satisfy virtually any roof condition.

**Sole Responsibility;** Pro-Bel provides complete fall protection products/systems from concept to the supply and installation of same, including annual inspection.

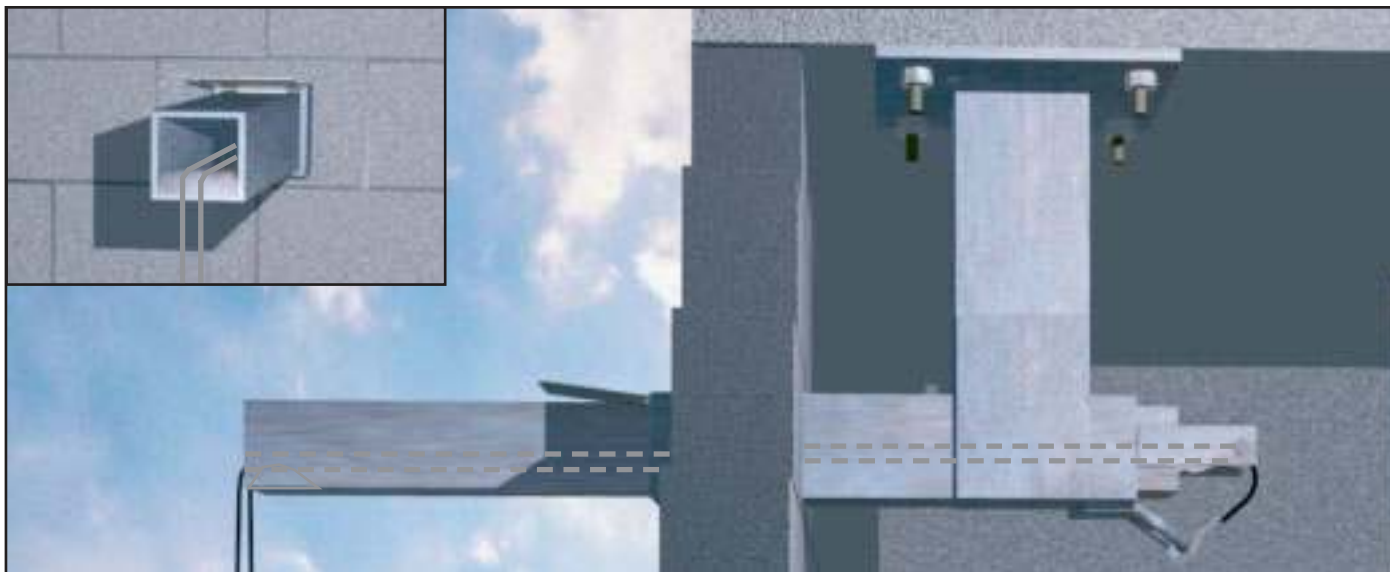
**Specific liability insurance:** all Pro-Bel rigging sleeve installations automatically carry \$2,000,000.00 coverage against product/system failure (over 4000 projects successfully completed to date).



Photo shows wall sleeve application. When not in service, rigging sleeves retract to interior of building. Wall is stucco finished masonry.



Horizontal rigging sleeve (in service position) is anchored to concrete roof beam and tied back to an interior wall mount safety anchor using steel cable. Worker's rope lifeline, tied to U-bar safety anchor, passes through sleeve to exterior.



Rigging sleeves are an effective solution for buildings that have difficult-to-access areas and are engineered to satisfy a particular job requirement. Safe access to rigging sleeves must also be determined.



This retrofit application shows rigging sleeves being installed to service interior atrium windows using a platform. A long sleeve was required so that the pedestal at the rear of the sleeve could be welded to a structural roof beam. Lower right hand photo, in a different location, employs a shorter sleeve due to the location of the roof beam. In either case, the primary suspension lines are shackled to a straight bar at the rear of the sleeve and the worker's lifeline is secured to a U-bar at the rear of the sleeve and fished through the sleeve to the atrium floor below. University of Delaware College of Business and Economics, Newark, Delaware.



Rigging sleeves (circled) in this application were used solely to facilitate site painting of the structural steel in two tower structures. Pearson International Airport, Toronto.



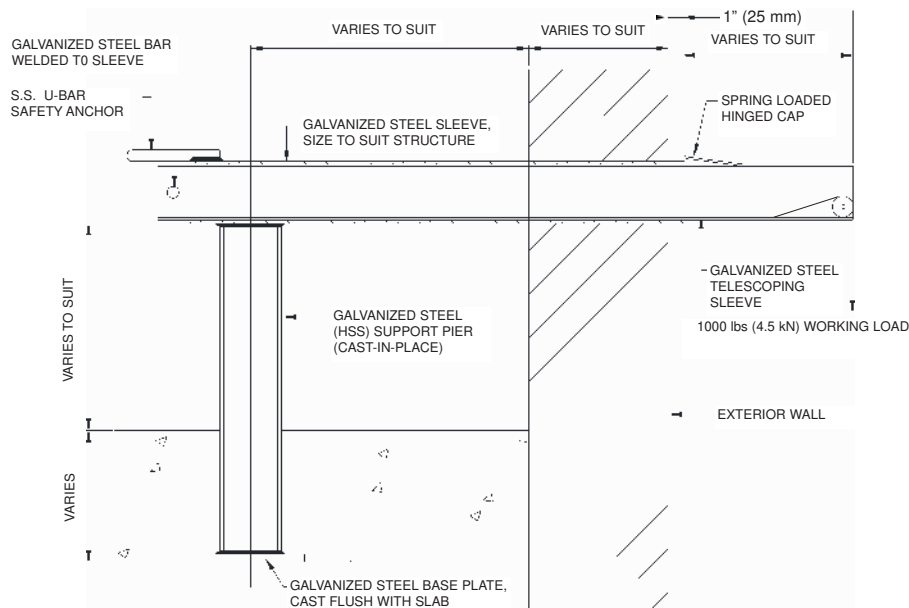


This series of Pro-Bel rigging sleeves, bolted to a concrete spandrel beam and located inside a mechanical penthouse at the twenty fifth floor, are used to feed and secure cable suspension lines and rope lifelines going to the exterior. The lines are dropped to a fourth floor roof for connection to an aluminum platform and to workers' safety harnesses, for window cleaning and other building maintenance. Consideration must always be given to accessing the sleeves safely. Sleeves are typically installed at the highest elevation possible and should be accessed using rigging platforms or other stable surface.



Rigging sleeve penetrating a skylight wall. In this project, a single portable sleeve was used to accommodate a motorized single work cage to access an interior monorail system in lieu of a hatch or operable window. Pedestal is welded to steel structural frame of the building. Beau Rivage Hotel and Casino, Biloxi, Mississippi.





**SECTION DETAIL – PRO-BEL TELESCOPING WALL-TYPE RIGGING SLEEVE  
(MODEL# RSH1-3100)**



#### Application

For facilitating passage of primary suspension lines and lifelines through wall. Typical locations include below a sloped metal roof, or at a high parapet or penthouse wall. Portable wall mounted push/pull steel outrigger sleeve telescopes out to provide required clearance with face of window or other type wall i.e. 24" (610 mm). Primary line is shackled onto straight bar while lifeline is shackled onto U-bar at back of sleeve. Mouth of outrigger sleeve is fitted with round metal to prevent chafing. Hinged cover plate is optional for weatherproofing or aesthetics.

Securement methods include cast-in-place, bolt through, bolt around, chemical adhesive, welding and/or mounting to steel pedestal reinforcing (can be flashed for exterior applications). Detail at left can be fabricated to suit any horizontal condition.



These three photos show a unique portable square rigging sleeve with handling wheels used to penetrate a parapet wall. Wide cornices prevent the use of davit arms or other equipment. The heavy sleeve is wheeled up to and slid through a portable yoke mounted on a permanent base. A primary line is shackled to a straight bar at the rear of the sleeve and worker's lifeline is secured to a U-bar at the front of the base.

#### MATERIALS/FABRICATION (as applicable)

**U-bar, anchor bolts:** Type 304 stainless steel with yield strength of 42 Ksi (290 MPa) or mild steel to ASTM A36, Type 350W with yield strength of 43 Ksi (297 MPa), hot-dip galvanized to ASTM A123/A 123M-2000.

**Hollow steel section (HSS) sleeves:** galvanized mild steel as above with yield strength of 50 Ksi (345 MPa).

**Plate and all other sections:** galvanized mild steel as above with yield strength of 43 Ksi (297 MPa).

**Roof mount sleeve caps:** detachable watertight cap with 1/8" (3 mm) cable tether with or without safety U-bar; Type

304 stainless steel with yield strength of 42 Ksi (290 MPa) or mild steel to ASTM A36, Type 350W with yield strength of 43 Ksi (297 MPa), hot-dip galvanized to ASTM A123/A 123M-2000.

**Bolts, nuts and washers:** Type 304 stainless steel or galvanized mild steel to ASTM A325.

#### DESIGN CONSIDERATIONS

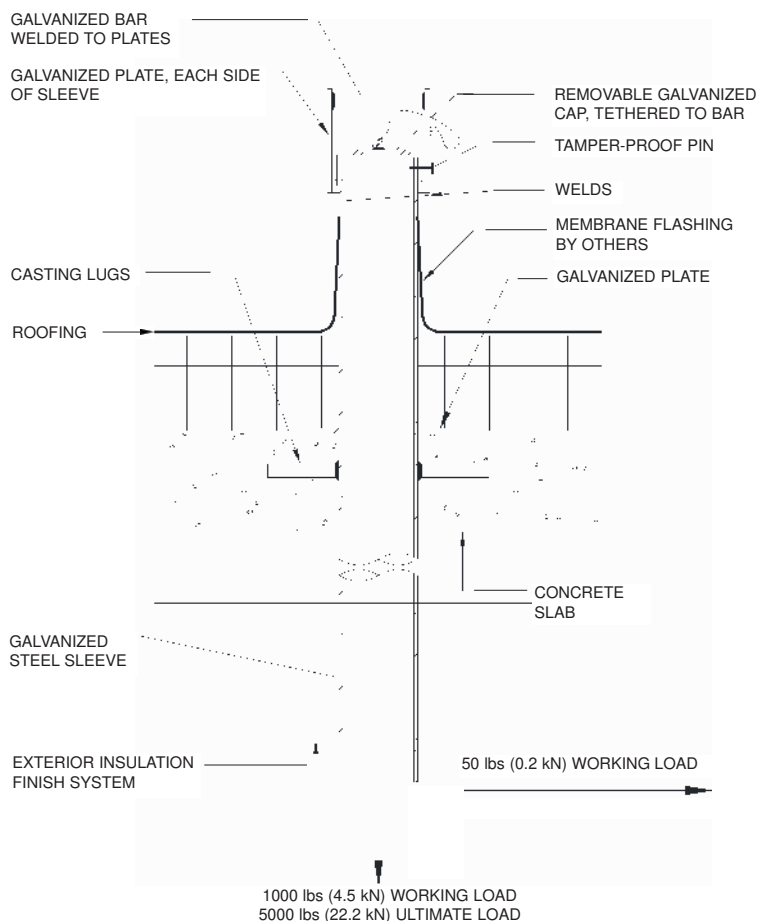
**Point of suspension:** arrange rigging sleeve layout to provide 24" (610 mm) distance between platform and face of glass or building.

**Highest level of suspension:** to access uppermost building areas or windows, locate rigging sleeves at highest point of building.

**Concealed securement locations:** Maintenance access is required at all concealed rigging sleeve securement and support locations. Special provisions e.g. access hatch, opening, etc. will need to be considered at soffits, ceiling, attic areas, and behind otherwise inaccessible spandrel beams, parapets, cornices and penthouse walls and ceilings.



**Pro-Bel roof-type rigging sleeve adapted for use in concrete floor.**



SECTION DETAIL – PRO-BEL ROOF TYPE RIGGING SLEEVE (MODEL# RSV2-1100)



Construction photo showing Pro-Bel roof type rigging sleeves. Pepsi Center, Denver, Colorado.

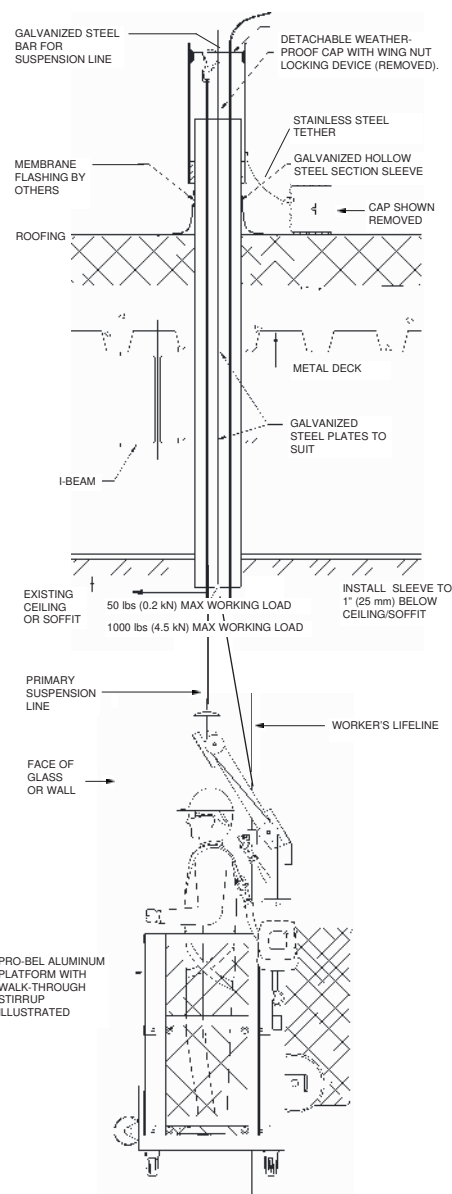


Illustration shows rooftop rigging sleeve employed for a platform application.

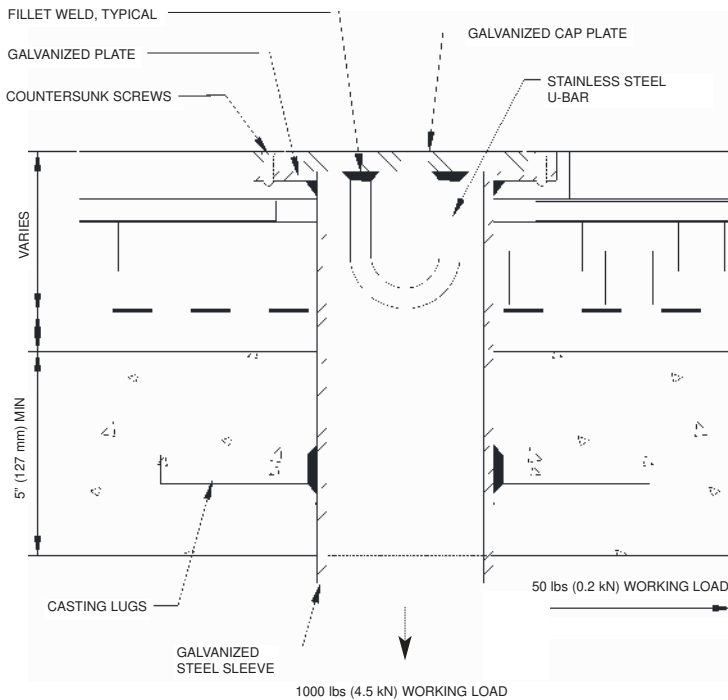
## Application

For facilitating passage of primary suspension lines and lifelines through roof. On roof, maintenance personnel e.g. window cleaner, removes weatherproof steel cap and shackles primary suspension line onto straight bar while shackling lifeline onto a separate, independent U-bar safety anchor and passing the line over the straight bar to prevent chafing.

Securement methods include cast-in-place, bolt-through, bolt around, chemical adhesive or welding. Can be fabricated and flashed to suit both new construction and retrofit applications.

Note: CAL OSHA requires the minimum inside diameter of vertical sleeves to be 6" (150 mm) to permit the passage of shackles, sockets, clamps and other rigging devices.





**SECTION DETAIL – PRO-BEL TERRACE RIGGING SLEEVE (MODEL# RSV2-8100)**

### Application

For facilitating passage of primary suspension lines and lifelines through terrace, promenade, paver, floor or similar type decks where a flush appearance or condition is desired. Maintenance personnel e.g. window cleaner, removes deck plate and shackles primary suspension line to U-bar or other suspension point while the worker's lifeline is attached to a second rigging sleeve or independent anchor.

Securement methods include cast-in-place, bolt through, bolt around, chemical adhesive, or welding. Sleeve can be round or square to suit any deck condition.



**Flush mounted rigging sleeve cap conceals a stainless steel U-bar. This sleeve is designed to suit all types of deck construction.**



Note: Rigging sleeve caps are removed during rigging procedure using detent pin lifting tool.

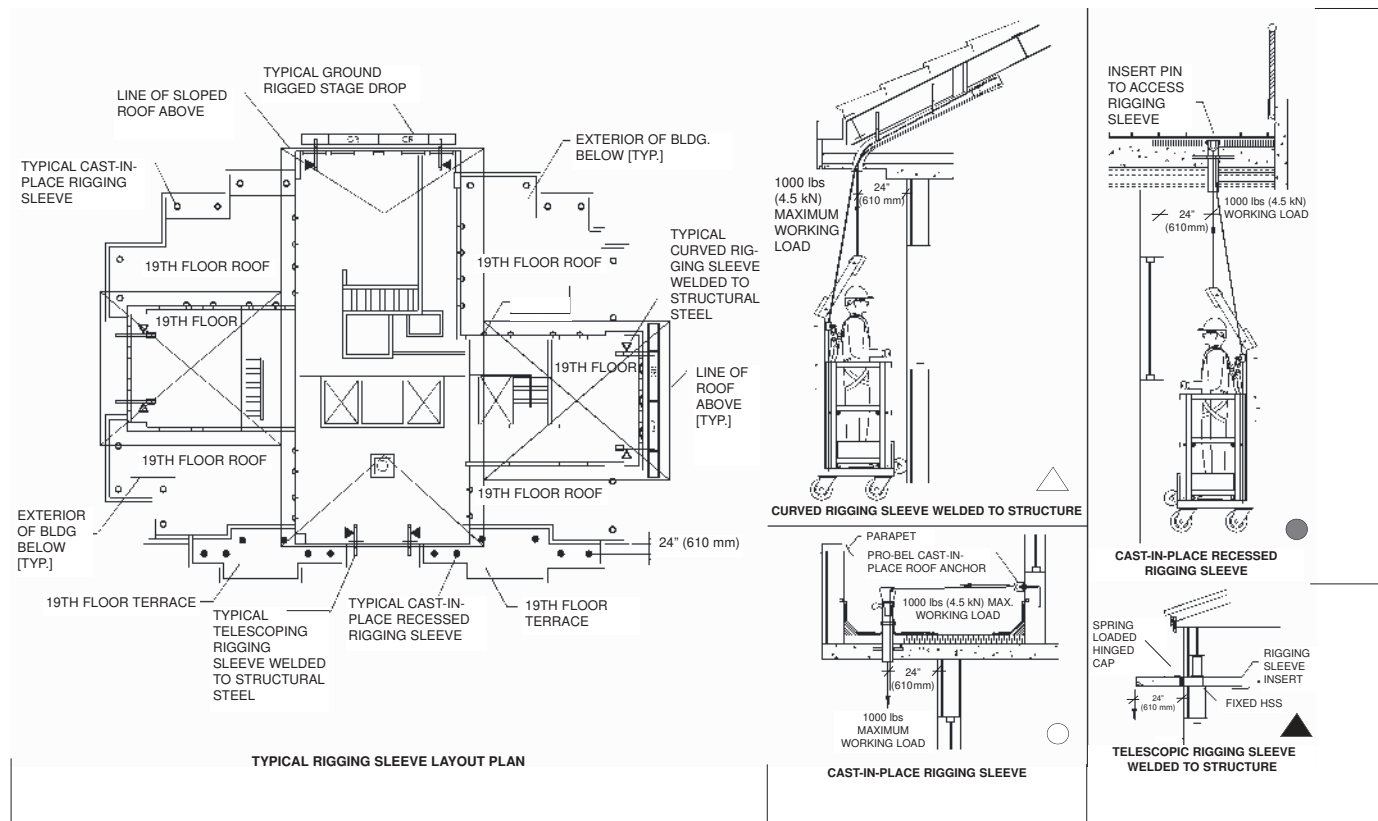


### RIGGING SLEEVE LAYOUT PROCEDURE

1. Review the Pro-Bel **System & Equipment Introduction literature (pages G-6 to G-18)**. This data provides an overview of the various equipment options used to clean windows or perform other suspended building maintenance.
2. Identify all areas that require rigging sleeve access. Mark all locations including windows on architectural plans.
3. Examine building elevations, reflected ceiling plans, balcony areas or other drawings to identify any recesses or other unusual features.
4. Examine building section details to assess construction of parapet wall, mechanical room wall, exterior walls, roof assembly and overhanging floor areas as necessary.
5. Examine roof or other type structural drawings for possible anchorage locations. Typically rigging sleeve anchors are anchored to structural concrete wall or slabs, steel superstructure, steel piers or similar elements.
6. Review the Design Considerations on page R-7 to assist in making a "rigging" decision.
7. Determine where rigging sleeves are to be located based on type of primary suspension equipment to be used e.g. platform or single work cage.
8. As a general rule of thumb, locating rigging sleeves at 8'-0" (2440 mm) centers will allow for separate rigging of suspension and lifelines through independent sleeves to suit both platform and single work cage. Alternatively, both the suspension line and the lifeline can be passed through the same rigging sleeve

providing that the OSHA 6'-0" (1830 mm) free fall requirement is maintained. In some cases the maintenance contractor may need to rig a platform using a four point suspension tie-off method (safety lanyard to be tied off to "dogline" on platform). When establishing rigging sleeve locations, they should be laid out suit building configuration with as few platform sizes as possible. A "drop" for a platform is typically 20'-0" to 28'-0" (7000 mm to 8535 mm) wide, evenly divided along the window wall or building. A "drop" for a single work cage is typically an 8'-0" (2440 mm) wide area.

9. Typically lifelines are independently secured to rooftop safety U-bar anchors with the lifelines passing through the rigging sleeves. For additional information/options relating to Pro-Bel U-bar anchors, refer to Pro-Bel Safety & Tie-Back Anchors literature.



## SPECIFICATION

*SPEC NOTE: This basic guide specification (Section 11 24 23 - Window Washing Systems) is devoted exclusively to rigging sleeves and related safety anchors and is written in accordance with the CSI/CSC Three Part Section Format. It must be adapted to suit the requirements of individual projects. If other equipment such as platforms, outrigger beams, davits, monorails, horizontal cable lifelines or other equipment is required, refer to appropriate Pro-Bel literature and incorporate materials and/or other clauses as required. Square brackets [ ] indicate choice, alternatives, data required or need for the specifier to make a decision.*

### PART 1 - GENERAL

#### 1.01 General Requirements

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

#### 1.02 Section Includes

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

#### 1.03 Related Sections

- A. Section [01 31 19 - Project Meetings].
- B. Section [01 61 00 - Common Product Requirements].
- C. Section [01 74 00 - Cleaning and Waste Management].
- D. Section [03 30 00 - Cast-in-Place Concrete: concrete runway, piers and sleepers for roof cars].
- E. Section [05 05 23 - Metal Fastenings: horizontal lifeline fasteners].
- F. Section [05 50 00 - Metal Fabrications: monorail and davit system cantilevered support brackets].
- G. Section [07 62 00 - Sheet Metal Flashing and Trim: aluminum flashing for davit bases].
- H. Section [08 31 13 - Access Doors and Frames: rigging access doors in walls].
- I. Section [08 44 00 - Curtain Wall and Glazed Assemblies: mullion and stabilization co-ordination].
- J. Section [22 11 16 - Domestic water Piping: hot and cold water supply, faucets and drains at [every] roof level].
- K. Section [26 00 00 - Electrical: climbing monorail power supply].
- L. Section [26 20 00 - Low Voltage Electrical Transmission: three phase 208 volts 60 Hertz service at [every] roof level].
- M. Section [26 25 00 - Enclosed Bus Assemblies: climbing monorail busbar].
- N. Section [01 78 00 - Closeout Submittals].

#### 1.04 References

- A. AISC 360-05 "Load and Resistance Factor Design Specification for Structural Steel Buildings".
- B. AISI SG-02KIT, with 2001 Supplement "Specification for Design of Cold-Formed Steel Structural Members".
- C. Aluminum Association AA ADM-1-Aluminum Design Manual, 2000 and ANSI/AWS D1.1/D1.1M:2008 Structural Welding Code - Aluminum.
- D. AWS D1.1-2000 Structural Welding Code - Steel.
- E. ANSI/IWCA I-14.1-2001 Window Cleaning Safety

Standard (International Window Cleaning Association).

#### 1.05 Design Requirements

- A. Design window cleaning/suspended maintenance system to suit building and in accordance with plans, specifications, standards, and regulations/codes contained in section 1.04 and 1.08.
- B. Locate rigging sleeves and safety anchors to suit suspension equipment which will be used on the building with respect to items such as reach, rigging, spacing, roof edge condition and similar items.
- C. 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.
- D. 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.
- E. Design system equipment supports and fall arrest safety anchors to comply with the following structural requirements:
  - 1. Design rigging sleeves for minimum vertical service load of 1,000 lbs (4.5 kN).
  - 2. Fall arrest safety anchors are designed to a typical maximum fall arresting force of 1800 lbs (8.0 kN) when wearing a body harness with a factor of safety of 2 without any permanent deformation and to 5000 lbs (22.2 kN) against fracture or detachment.

#### 1.06 Shop Drawings and Engineering Certification

- A. 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.
- B. Shop drawings to include installation and rigging instructions and all necessary Restrictive and Non-Restrictive Working Usage Notes and General Safety Notes.
- C. Shop drawings to be reviewed by a professional engineer, and upon request, complete with calculations.

#### 1.07 Qualifications

- A. 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.
- B. 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.
- C. 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.

- D. Welding to be executed by certified welders in accordance with AWS requirements.

#### 1.08 Regulatory Requirements

*SPEC NOTE: Re 1.08,A. Specify for all States other than New York and California.*

- A. Comply with the following OSHA regulations:
  - 1. 1910, Subpart D (Walking and Working Surfaces).
  - 2. Appendix C to 1910 (Personal Fall Arrest Systems).
  - 3. "OSHA Ruling on Window Cleaning by Bosun's Chair" Memorandum to Regional Administrators from P. K. Clark, Director, Directorate of Compliance Programs.
  - 4. 1910, Subpart F (Powered Platforms).

*SPEC NOTE: Re 1.08,B and 1.08,C. Specify for New York State or California only as applicable.*

- B. Comply with the following New York State regulations:

- 1. Department of Labor Advisory Standard 101 - Construction, Operation and Maintenance of Suspended Scaffolds Used for Window Cleaning and Light Maintenance.
- 2. Advisory Standard 111 - Hoisting Machines Used for Suspended Scaffolds.
- 3. Department of Labor Industrial Code Rule 21 - Protection of Persons Employed at Window Cleaning - Structural Requirements, Equipment and Procedures.

- C. Comply with the following California State regulation:

- 1. Code of Regulations, Title 8 - Industrial Relations, Article 5 (Window Cleaning), Article 6 (Powered Platforms for Exterior Building Maintenance), and Appendix C to Article 6 (Personal Fall Arrest System).

#### 1.09 Maintenance Data

- A. Submit 1 copy of system Equipment Manual & Inspection Log Book, with "Initial Inspection - Certification for Use" and "Inspection Sign-Off" forms completed.
- B. 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.

## PART 2 - PRODUCTS

#### 2.01 Manufacturer

- A. This specification is generally based on systems currently being manufactured by PRO-BEL Group LTD., Toll free: 1-800-461-0575 Telephone: 905-427-0616, Fax: 905-427-2545, info@pro-bel.ca.

- B. Other manufactured products meeting this specification may be substituted provided that manufacturers show 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.



## 2.02 Equipment

*SPEC NOTE: List type and quantity as required.*

- A. [ \_\_\_\_\_ ]  
 B. [ \_\_\_\_\_ ]  
 C. [ \_\_\_\_\_ ]

## 2.03 Materials

*SPEC NOTE: Delete items not required.*

- A. Safety U-bars: [Type 304 stainless steel with yield strength of 35 Ksi (240 MPa)] [mild steel, Type 300W with yield strength of 44 Ksi (300 MPa), hot-dip galvanized to ASTM A123/A 123M-2000]. U-bar to be not less than 3/4" (19 mm) diameter material with 1-1/2" (38 mm) eye opening.
- B. Securement bolts: [mild steel, Type 300W with yield strength of 44 Ksi (300 MPa), hot-dip galvanized to ASTM A123/A 123M-2000] [Type 304 stainless steel with yield strength of 35 Ksi (240 MPa)].
- C. Straight suspension bars: 3/4" (19 mm) diameter mild steel with yield strength of 35 Ksi (240 MPa), hot-dip galvanized to ASTM A123/A 123M-2000.
- D. Hollow steel section (HSS) sleeves: galvanized mild steel as per 2.03.A above with yield strength of 50 Ksi (350 MPa) of wall thickness to suit application.
- E. Hollow steel section (HSS) piers: galvanized steel as above with yield strength of 50 Ksi (350 MPa). Wall thickness to suit application.
- F. Plate and all other sections: galvanized mild steel as above with yield strength of 44 Ksi (300 MPa). Thickness and securement to suit application.
- G. Miscellaneous bolts, nuts and washers: mild

steel, Type 300W with yield strength of 44 Ksi (300 MPa), hot-dip galvanized to ASTM A123/A 123M-2000 or Type 304 stainless steel with yield strength of 35 Ksi (240 MPa).

## 2.04 Fabrication

- A. General:  
 1. Fabricate work true to dimension, square, plumb, level and free from distortion or defects detrimental to appearance and performance.  
 2. Grind off surplus welding material and ensure exposed internal corners have smooth lines.
- B. Wall mounted rigging sleeves:  
 1. Fabricate with flip-up hinged door to accommodate push/pull outrigger.
- C. Curved rigging sleeves:  
 1. Bend with smooth radius finish to protect suspension or safety lines from chafing.

## PART 3 - EXECUTION

### 3.01 Examination

- A. 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.
- B. Verify site dimensions.
- C. Commencement of work will imply acceptance of prepared work.

### 3.02 Installation

- A. Install equipment in accordance with approved shop drawings and manufacturer's recommendations.

*SPEC NOTE: Re 3.02.B. In Roof Section [07500], specify all roof mounted bases and piers to be properly flashed in compatible with roofing where applicable.*

- B. Co-ordinate installation with work of related trades.

- C. Install all work true, level, tightly fitted and flush with adjacent surfaces as required.

- D. Deform threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal or vandalism.

*SPEC NOTE: Re 3.02.E. Specify for furnish only projects if required.*

- E. Manufacturer to assist and/or supervise installation of window cleaning equipment installed by others.

- F. Structural steel to receive safety anchors to have adequate bearing surface as indicated on shop drawings and/or to ensure 100% weld.

### 3.03 Final Adjusting and Inspection

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

### 3.04 Testing

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

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