



INDUSTRIAL FALL PROTECTION

INTRODUCTION

Every industry in North America has potential employee fall hazards, and fall protection and related equipment is a subject with which facility managers and safety supervisors are familiar.

However, difficulties arise when trying to source a full service company to provide a complete engineered and certified fall protection system that will take responsibility for:

- engineering and designing a total fall protection system
- engineering and certifying supporting structures
- providing proper documentation, including engineer stamped drawings, and inspection and maintenance Log Books.

The benefits derived from a complete engineered and documented fall protection system include:

- Better organized facilities
- Greater employee cooperation
- Greater productivity for management
- Less danger to life on the job
- Lower insurance risk for hazardous work in high places
- Liability protection in the event of a civil lawsuit

Pro-Bel offers fall protection systems that cover three important areas:

1. Fall Protection
2. Fall Prevention
3. Fall Arrest

Fall protection is the elimination or effective control of fall hazards. *Fall prevention* is the reasonable protection of personnel from accidental falls on the same level and deals with floors, walls, guardrails, and other physical barriers. *Fall arrest* deals with protection from injury in accidental falls as the fall occurs and before fall prevention can reasonably be applied.

WHY PRO-BEL SYSTEMS?

Currently, Pro-Bel Group Ltd. is celebrating over 8000 engineered systems utilizing Pro-Bel fall protection equipment.

Pro-Bel has acquired a reputation as a highly qualified authority for any industry contemplating a specialized approach to fall protection. Facilities managers, owners, property managers, safety personnel and design professionals can have confidence that when they select a Pro-Bel system, they are choosing a system designed, engineered and manufactured by industry experts while obtaining single source compatibility and responsibility. Pro-Bel has a track record for safety second to none.

With an extensive engineering and construction background, Pro-Bel can evaluate all types of industrial sites, work practices, and related support structures such as steel framing, roofing systems, walls, glazing, and similar building elements in order to provide a design solution for any given facility.

Many existing industrial facilities are not provided with suitable equipment or anchorages for securement of workers lifelines. These facilities must be evaluated and retrofitted if tragic accidents are to be avoided.

The Pro-Bel Advantage

- Comprehensive consulting and reporting for a reasonably low cost.
- Pro-Bel provides budget pricing based on an investigative knowledge of the project via a Pro-Bel evaluation report.
- Pro-Bel customers receive the assurance of many years experience with OSHA standards and related codes.
- Pro-Bel customers can be assured system design will suit maintenance practices and fall protection requirements.

Scope of Work

A typical industrial fall protection evaluation program includes the following Pro-Bel services:

1. Site visit to review facilities, structure, and potential fall hazards.
2. Photographing the existing equipment/anchorages.
3. Providing recommendations for testing and certification of equipment and anchorages.
4. Verification of system for compliance with OSHA related standards and State building codes/safety regulations.
5. Review of architectural and structural drawings if available.
6. If required, design of new equipment/anchorages to supplement existing, for use with existing fall protection systems.
7. Budget pricing for both supply and installation.
8. Technical specifications.
9. Preliminary design layout and details for securement of equipment anchorages.



Pro-Bel fall protection products were used to retrofit the GMS/Bennet Dam, including over 1000 feet (305 m) of Pro-Bel "Hands-Free" Horizontal Cable System, and safety anchors for both vertical and horizontal lifelines. Photos courtesy of British Columbia Hydro and Power Authority, Burnaby, B.C., Canada.

TOTAL SERVICE

Pro-Bel engineered systems include the structural anchorage (safety anchors, overhead rails, horizontal cable system, etc.), connecting lines (lanyard, retracting lifeline devices, "droplines", etc.) and body support (harness or body belt) – all designed to provide 100% protection at all times. Design recommendations are based on an engineering approach to the resolution of problems.

Pro-Bel offers a single source compatibility and single source responsibility by providing a design, manufacturing, installation, training, and annual inspection capability. Single source responsibility promotes speed and economy as well as a predictable outcome and non-adversarial work relationships. Fundamentally, it is in the facilities manager's best interests to select an equipment manufacturer who can provide assurance that the system meets intended work methods and that certification of the system meets OSHA requirements.

Pro-Bel's greatest competitive advantage lies in an extensive knowledge of engineered systems and expertise with OSHA standards. Building quality installations to codes and specifications using Pro-Bel work forces is reflected in the quality and diversity of Pro-Bel systems featuring safety, ease of use, practicality and economy. Also, it is imperative that facilities managers understand that purchasers of Pro-Bel systems do not pay a premium when dealing with experts.

PRODUCT DESCRIPTION

Pro-Bel systems/products include:

- Localized Safety Anchors
- Rooftop Systems
- Horizontal Rail Systems
- Horizontal Cable Systems
- Rigging Sleeves
- Safety Guardrails
- Fixed Ladders and Ladder Fall Protection Systems

How the above systems or equipment is used or "rigged" depends upon the function or type of maintenance to be performed and the available building elements to which equipment will be affixed. Essentially, Pro-Bel fall protection systems are designed around whatever is available. Following on the next few pages is a brief overview of how Pro-Bel products are employed.

USE

Fall protection equipment is very specific in its application and great care must be taken to ensure the correct system for the application intended. Listed below are examples of the type of industries being served by Pro-Bel engineered systems.

- | | |
|------------------------|----------------------|
| • Manufacturing | • Sewerage |
| • Building maintenance | • Distribution |
| • Chemical | • Telecommunications |
| • Railway | • Contracting |
| • Aviation | • Oil & Gas |
| • Shipping | • Electricity |



Retractable lanyard secured to Pro-Bel overhead trolley rail (bus garage).



Retractable lanyard secured to body harness with other end secured to single span Pro-Bel horizontal cable lifeline system. GMS/Bennet Dam.



Spillway fall protection system at GMS/Bennet facility shown in photo on page I-2. Pro-Bel Horizontal Cable System is employed to safely traverse the spillway arm which is 70'-0" to 90'-0" (21.3 m to 27.5 m) above the spillway concrete surface below.

FEATURES

Standards Conformance: All Pro-Bel designed, engineered, and manufactured fall protection equipment and systems conforms to OSHA/State Codes and ASME/ANSI safety requirements, and various materials standards.

Engineer Certified: OSHA requires that fall protection equipment be designed by or under the direction of a registered professional engineer experienced in such design. Pro-Bel equipment and systems are certified by a professional engineer and documented with an engineer approved/stamped drawing for the state or province in which the project is completed. Equipment performance is based upon data derived from independent testing and/or engineering calculations.

All corrosion resistant materials; metal anchor and other components are stainless steel, aluminum and hot-dip galvanized steel.

Compatible with roofing, etc.; an important consideration in the design of Pro-Bel roof mounted products is the need to maintain the long term watertight integrity of the structure where Pro-Bel products are used on roofs or other waterproofed areas. Pro-Bel products are designed with a full understanding of reli-

able flashing/sealing techniques to satisfy virtually any roof or wall penetration.

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

Specific liability insurance; Pro-Bel automatically provides \$2,000,000.00 coverage against product/system failure.

LOCALIZED ANCHORS

The critical requirement with all fall protection — the anchorage point — is the position on an independent structure to which the fall arrest device or lanyard is securely attached. The current OSHA requirement for an anchorage is a minimum strength of 5000 lbs (22.2 kN).

There are literally dozens of Pro-Bel safety anchor products available. Each has been engineered to satisfy a particular job requirement. These anchors feature a patented stainless steel U-bar and a few examples are shown here.

In addition, with retractable lanyard systems, a fixture point above head height can be accomplished using a horizontal rail along which a trolley can slide smoothly.



Typical Pro-Bel catwalk anchor. Can be secured to all types of metal surfaces.



Typical Pro-Bel wall anchor. Can be structurally secured to all types of vertical surfaces.



One of many Pro-Bel safety anchor retrofit products. U-bar is welded to steel post which is affixed to concrete walkway using epoxy adhesive anchor bolts. Retractable lanyard is attached to U-bar. Also see safety guardrails data on page I-7.



Typical Pro-Bel ledge anchor which is accessed via a horizontal cable lifeline ("Hands-Free" system at intermediate bracket shown).



Pro-Bel wall anchor bolted to steel support beam.

ROOFTOP SYSTEMS

Safety Guardrails

The guarding of low-pitched roof perimeters during the performance of routine or occasional maintenance work can be achieved using Pro-Bel continuous or localized guardrails. See Safety Guardrails on page I-7.



Localized railing

Localized Safety Anchors

Pro-Bel fall arrest anchors provide attachment between the building structure and the worker's fall protection system. Pro-Bel anchors are engineered for all types of roof (or wall) construction regardless of composition or complexity and provide protection for maintenance personnel servicing rooftop video surveillance cameras and flood lighting, material hoisting operations, and similar activities, as well as support and protection for window cleaning or other suspended maintenance personnel. See Localized Anchors on page I-4.



Localized safety roof anchor

Horizontal Cable Lifeline Systems

Essentially, workers performing routine maintenance while working within 6'-0" (1830 mm) of roof edges without a 42" (1067 mm) high guardrail or parapet can be protected using localized guardrails or

safety anchors. For non-routine maintenance e.g. inspecting roof edge flashing, mechanical equipment, ductwork, etc., the balance of the roof may be serviced using a Pro-Bel horizontal cable lifeline system. Cable systems are designed for restraint but must be engineered for fall protection (fall arrest).



Horizontal cable lifeline system

Materials Winch-Hoists

Pro-Bel roof mounted galvanized all steel winch-hoists are fixed/storable hoists, available motor operated or manual for hoisting retrofit mechanical or electrical equipment, re-roofing materials, window cleaning equipment, and similar materials onto roofs. Hoists are equipped with 360° rotating head and galvanized steel hoisting cable.



Roof mounted materials winch-hoist

Rigging Sleeves

Pro-Bel galvanized steel rigging sleeves allow maintenance personnel to pass or fish standard lifelines or retractable lifelines through roof mounted pipe sleeves which can be adapted to suit virtually any roof system. Sleeves can be located anywhere on the roof to coincide with the equipment or area below to be serviced within the building. An important consideration in the design of Pro-Bel rigging sleeve penetrations 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 any roof condition.



Rigging sleeve application

Rooftop Supports

Pro-Bel also manufactures a complementary line of rooftop supports for pipes, satellite dishes, catwalks, cellular towers, antenna, guy wire securement, air conditioning units and similar equipment. These supports can be supplied as stand alone items or combined with Pro-Bel U-bar safety anchors and are secured and can be flashed in using the same methods employed for Pro-Bel safety anchors and rigging sleeves.



HORIZONTAL TROLLEY RAIL SYSTEMS

A horizontal trolley rail fall protection system, if practical, is often the preferred method of providing horizontal mobility while working close to an unprotected vertical drop.

Trolley rails cost more than horizontal cable systems however rails provide additional benefits such as:

- Reduced fall distances in overhead applications – less than 2'-0" (610 mm) vs up to 6'-0" (1830 mm) for cable systems due to the "elastic" properties inherent in cable systems.
- Less maintenance (minimal inspection, no parts replacement, no out-of-service time in the event of a fall, etc.).
- Greater user confidence, convenience and comfort due to the rigidity of the system, support spacing, even plane, stability, and smooth, uninterrupted movement over long distances, or while using retractable lifelines in an angular plane.
- Ease of relocation in the event of alterations to plant or other facility and convenient expansion capability.



Pro-Bel overhead trolley rail (with retractable lanyard, inset) is used for fall protection while servicing top of vehicles in bus bay garage.

HORIZONTAL CABLE SYSTEM

A horizontal cable system is a steel anchoring cable designed to be rigged between two or more fixed anchorage points on the same level. This serves as a mobile fixture point for the attachment of lanyards, or retracting lifelines. The purpose is to limit swing injuries by providing a continuously overhead or other type fixture point as the worker moves horizontally.

Extremely careful engineering is required for all horizontal cable systems due to the possibility of the system being subjected to "amplified loads" * in the event of an accident. Pro-Bel offers two types of horizontal cable systems — the "Hands-Free" which provides continuous protection and the more economical Double Lanyard (DL) Horizontal Lifeline which is non-continuous. Both systems employ either a 5/16" (8 mm) or 1/2" (12 mm) cable — stainless steel for the "Hands-Free" and galvanized steel for the DL.

Horizontal cable systems employ any of the myriad Pro-Bel safety anchor products at terminal points, and intermediate locations if required. The many uses of horizontal cable systems are illustrated in the photographs that follow.

* Horizontal cable systems used in most industrial situations can be considered a controlled working environment such as when the cable system is used for restraint or fall arrest to suit the allowable numbers of users. Special considerations must be given to using cable systems at roof level when the exterior building elevations are serviced using a suspended platform for maintenance (non-controlled working environment).



Workman inspecting train in railway yard using "Hands-Free" Cable system.



Pro-Bel "Hands-Free" Horizontal cable lifeline provides 100% continuous protection for electrical, mechanical and roof inspection maintenance, and access to window cleaning, exterior maintenance, tie-back, and lifeline anchors when necessary.

FIXED LADDERS & LADDER FALL PROTECTION SYSTEMS

For protection against falls, OSHA states that fixed ladders over 20'-0" (6 m) in height must have a ladder safety device. The Pro-Bel cable-based ladder safety system, which offers continuous protection, provides an ideal means of protection when climbing a fixed ladder. Pro-Bel can provide the cable system only (including appropriate harness) or both the ladder and the cable system.

The ladder itself is fabricated using galvanized steel or with other type finish, and with or without a platform at the top with a 42" (1067 mm) high guardrail.

Ladder Safety Device

The cable system consists of a tensioned 3/8" (10 mm) steel cable running the height of the climbing area. The worker is connected to the cable and begins to ascend or descend at a normal rate without attending to the connector. Should the worker slip or fall the connector locks onto the cable within inches of the fall and prevents further movement until the worker's footing can be regained.

The top bracket incorporates an elastomeric impact attenuator to help absorb the dynamic loads imposed during a fall arrest situation. The bottom bracket incorporates a mechanism for tensioning of the cable.

The cable, brackets and fasteners are available in galvanized steel as standard or optional stainless steel. Note: the connector is intended to arrest the fall of personnel only (not material) should a slip occur.

Use

The Pro-Bel cable-based ladder safety system is designed for use on almost any structure including towers, chimneys, silos, pylons, masts, offshore platforms, buildings, and similar structures;

Features

- Hands-free operation.
- User can work, and rest, at any point in complete safety.
- Provides fall protection with full climbing freedom.
- Eliminates need for caging or ladder hoops.
- Meets or exceeds OSHA 1910.27, FAA RR-S-001301 and ANSI A14.3-1992.



Worker is connected to continuous, tensioned vertical steel cable on this fixed Pro-Bel ladder. In the event of a slip or fall, the connector locks onto the cable within inches of a fall.



Both roofs above are accessed using Pro-Bel fixed metal ladders with vertical cable safety system. Continuous safety rail at ridge of roof and lower roof horizontal cable lifeline provides for a compatible fall protection system.

SAFETY GUARDRAILS

Railings designed to OSHA regulations should be the rule for unprotected edges which must be approached within 6'-0" (1830 mm) and where there is a drop of over 4'-0" (1220 mm).

A standard Pro-Bel railing consists of a top rail, intermediate rail, and posts, and has a nominal safety rail height of 42" (1067 mm). Rails are tubular pipe rails 1-1/2" (38 mm) nominal outside diameter with posts spaced not more than 8'-0" (2440 mm) on centers. Railings are anchored to withstand at least a load of 200 lbs (0.9 kN) applied in any direction at any point on the top rail.

Example uses for Pro-Bel Guardrails include:

- Guarding floor and wall openings and holes
- Protection of open sided floors, platforms and runways
- Roof edges with low parapets
- Industrial stairs, catwalks and similar applications
- Protection from the hazards of open pits, tanks, vats, ditches, waterside edges, etc..



Pro-Bel standard 42" (1067 mm) high tubular aluminum safety guardrail for edges having a drop greater than 4'-0" (1220 mm).

EQUIPMENT CONSIDERATIONS

Correct Safety Equipment; the success of any fall protection system depends on the employer's and worker's commitment to both accurately determine the risk and conscientiously use and maintain the equipment in a manner appropriate to the specific application. The engineered system must be designed and certified for specific applications clearly defined by the employer with a knowledge of the limits of the capability of that equipment.

Continuous Protection; equipment should be chosen that requires a minimum of connecting and disconnecting; passive devices which afford continuous protection in hazardous areas are most likely to be accepted and used by the worker.

Convenience; lifeline and fall protection systems, especially, should not encumber or frustrate the worker. Equipment maintenance should focus on visual inspections.

INSTALLATION

Due to liability issues, Pro-Bel fall protection systems are installed either under "Sole Responsibility Contracts" or furnish only with installation by others utilizing a strictly controlled sign-off and certification procedure.

AVAILABILITY & COST

Pro-Bel engineered fall protection systems are distributed throughout the United States, Canada and internationally.

Budget pricing is provided on a project-to-project basis for both materials and installation, or materials only.

WARRANTY

Warranty is in accordance with standard Pro-Bel Guarantee/Warranty terms and conditions of sale. Copy of Guarantee/Warranty available upon request.

MAINTENANCE

Depending on the type of fall protection system required, equipment and anchorages must be inspected annually as a minimum requirement as per OSHA General Industry and Duty Clause, Section 5(a)(1).

Pro-Bel Inspection Services

Pro-Bel offers owners/employers two inspection options. Inspections may be carried out using Pro-Bel staff or an independent engineer.

Regardless of option selected, Pro-Bel must provide a "Certification For Use" sign-off document at a minimal fee. Pro-Bel maintains up-to-date inspection records of all Pro-Bel manufactured equipment/installations. All inspection data is recorded in the facility owner's/ employer's Equipment Manual & Inspection Log Book. The Log Book, containing the necessary information to comply with all relevant State and Federal safety standards, will help safeguard lives as well as reduce the owner's/employer's legal exposure in the event of an accident.

TOTAL DESIGN SERVICE

The selection of a fall protection system is a performance oriented and highly specialized area. Also the issues of fall protection and fall arrest are serious concerns with OSHA inspection authorities. Interpreting the myriad of OSHA standards, including the requirements of various states and proposed changes is a daunting task at best.

Every industrial application requires an individual technical approach and a time commitment beyond the scope of most facilities managers and owners/ employers. Even with a high degree of knowledge and the best of intentions, the planning process can go askew. It is for these reasons that Pro-Bel provides interested parties with a TOTAL DESIGN SERVICE thereby ensuring that Pro-Bel Systems are properly specified and installed.

OTHER PRO-BEL PRODUCTS

Currently, Pro-Bel Group Ltd. is celebrating over 8000 engineered systems utilizing Pro-Bel fall protection equipment.

In addition to manufacturing/supplying an extensive line of engineered fall protection, fall arrest and restraint systems for industrial and building maintenance, Pro-Bel also provide construction professionals and building owners with suspended maintenance equipment including:

- Davit Systems
- Outrigger Beam Systems
- Monorail Systems
- Rigging Sleeve Systems
- Horizontal Rail/ Cable Systems
- Permanent Powered Platforms
- Gantry Systems
- Stabilization Systems
- Rooftop Anchors
- Material Winch-Hoists



Worker inspecting pipe at roof level from lift platform. Sometimes workers forget where they are and tend to stand on platform rails for a better look – an unsafe practice. Overhead trolley rail and retractable lanyard provide reliable fall protection.

SERVING CANADA, THE UNITED STATES AND THROUGHOUT THE WORLD

TO FIND ADDITIONAL PRO-BEL LOCATIONS IN YOUR AREA PLEASE VISIT OUR WEBSITE...

www.pro-belgroup.com

Pro-Bel Group Ltd.
(Florida)
2501 NW 34th Place, Unit 23
Pompano Beach, FL 33069
954-457-5080 - local
866-377-6235 - toll free
954-457-9010 - fax
info@pro-belgroup.com

Pro-Bel Group Ltd.
(Chicago)
2850 West Fulton Street
Chicago, IL 60612
773-638-6714 - local
773-638-6715 - fax
info@pro-belgroup.com

Pro-Bel Group Ltd.
(Pennsylvania)
421 Guilford Avenue
PO BOX 556
Chambersburg, PA 17201
(717) 263-7400 - local
(717) 263-7414 - fax
info@pro-belgroup.com

Pro-Bel
(China)
36 Guangqumennei St.
Beijing, 100036, China
(+86.10.6718 6272 - local
(+86.10.6713 8186 - fax
(+86.139 1146 0532 - cell
www.pro-bel.com.cn

Pro-Bel Enterprises Ltd.
(India)
#26, Chamundi Mansions
22nd Main, 2nd Phase
JP Nagar Bangalore
560078
(080) 2658-7856 - local