

NEW



CONVEYING SYSTEMS
tower hoist personnel cage

14200
8 03

Pro-Bel Enterprises
Limited



**Suspended Maintenance
& Fall Protection Systems**

**TOWER HOIST®
PERSONNEL CAGE
TH250 (Interior)
TH250-U (Exterior)**



1-800-461-0575

www.pro-bel.ca

info@pro-bel.ca

SUSPENDED EQUIPMENT & FALL PROTECTION EXPERTS

DESCRIPTION

The Pro-Bel TH250 Tower Hoist[®] Personnel Cage is fully enclosed and manufactured using 6061-T6 mill finished aluminum for both the cage and the structural frame. It is designed to travel on existing or new vertical metal ladders that are normally used to access tower structures such as communications towers, wind turbines, water reservoirs, and similar facilities.

A standard *interior* Tower Hoist Personnel Cage (TH250) is equipped with: guide wheels for mounting to a metal ladder; perforated upward acting aluminum door; virtually unbreakable vision glass on three sides as well as the ceiling of the cage; automatic controls and manually operated emergency descent control handle (in both cage and at base); H400E traction hoist on top of the cage; 5/16" (8 mm) diameter primary and secondary galvanized steel suspension ropes (weighted at bottom); secondary overspeed safety brake; trailing power supply cable; and upper and lower limit switches.

An *exterior* Tower Hoist Personnel Cage (TH250-U) is the same as the TH250 except the cage is designed for outdoor use and is provided with a cover on top to protect the electrical components and utilizes a power conductor rail in lieu of a trailing cable. In addition there is a use restriction at wind-speeds above 65 mph (105 km/h).

Tower Hoist Personnel Cages are equipped with a single full body harness with a double lanyard system – one lanyard for attachment to a safety anchor eye on the cage interior and the second lanyard (equipped with a runner) for attachment to the vertical cable on the emergency ladder – for 100% tie-off at all times.

USE

- For accessing the top of tower structures for inspection and/or maintenance.
- Suggested uses include accessing the full height of:

- | | |
|-------------------------|-------------------------------|
| - Wind turbines | - Oil rigs |
| - Hydro towers | - Catwalk structures |
| - Communications towers | - Water reservoirs |
| - Nuclear power plants | - Petrochemical storage tanks |
| - Tower cranes | - Silos |
| | - Chimneys |



Pro-Bel TH250-U Tower Hoist Personnel Cage showing H400E traction hoist on top of cage.

- Interior (TH250) or exterior (TH250-U).
- 550 lbs (250 kg) working load or two persons.
- Can be retrofit to existing metal ladder or supplied complete with aluminum ladder for new construction.
- Suitable for tower heights up to 492'-0" (150 m) with maximum of $\pm 4^\circ$ from vertical.
- Permitted in areas with restricted admittance and for use by authorized personnel only.

FEATURES

Eliminates climber fatigue; enables safe, effortless and quick access to any point on tower, especially when carrying tools or supplies, even in poor weather.

Allows longer time on job; experienced personnel can stay on job for extended periods of time and for greater number of years as physical and mental stress of climbing is eliminated. On offshore tower locations where time is critical, service personnel can substantially reduce stand-by time for boats or helicopters.

Running-in costs can be substantially reduced in wind turbine applications that require frequent initial inspection visits.

Easy and safe exit/entry; upward acting access door prevents door being opened by accident. Cage will not operate with door in open position. Anchor attachment points for operator's safety harness (double lanyard) are provided inside cage and on emergency ladder. Perforated door permits viewing of stop position.

Strong, user-friendly cage; fabricated using 6061-T6 mill finish aluminum without seams at vertical corners, high impact resistant polycarbonate viewing windows on 3 walls and in roof provides for a comfortable ride, excellent sight lines, and protection against potential falling objects.

Potential payback benefit depending on frequency of inspection/maintenance due to time savings.

Standards conformance; complies with OSHA, ASME/ANSI and UL requirements.

Engineer certified; Tower Hoist performance is based on data derived from independent testing and/or engineering calculations.

Primary and secondary safety devices include; hold-to-run controls in cage and at base of tower; overload detection system; flashing light when operating; emergency stop button; top and bottom limit switches; emergency descent with no power; interlock switch for closed door; failsafe detection and cut-out switch if obstruction on ladder is detected; and secondary overspeed safety brake.

Excellent stability; permanently fixed emergency ladder acts as guide system. Four sets of dual guide wheels secure and stabilize the cage both sides of ladder during use (even in operating wind turbines).

All corrosion resistant materials; components are aluminum, hot dipped galvanized steel, and stainless steel.

Shipped completely assembled and pre-wired ready for installation to emergency ladder/guide rails.

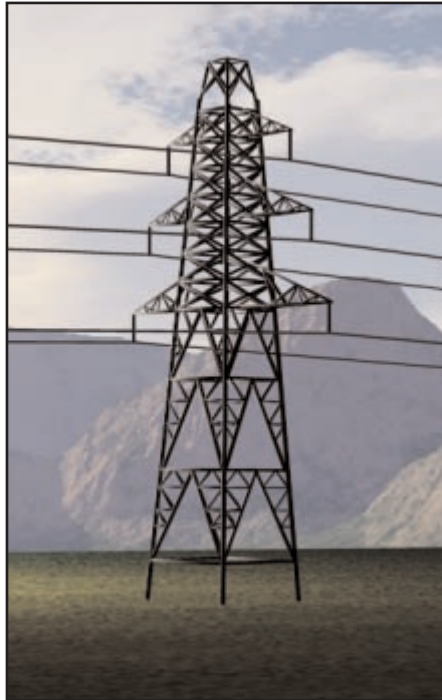
Specific liability insurance; all Pro-Bel Tower Hoist installations automatically carry \$2,000,000.00 coverage against product/system failure (over 4000 suspended maintenance projects completed to date).

Provides Effortless, Safe, Quick Access Up to 492'-0" (150 m)

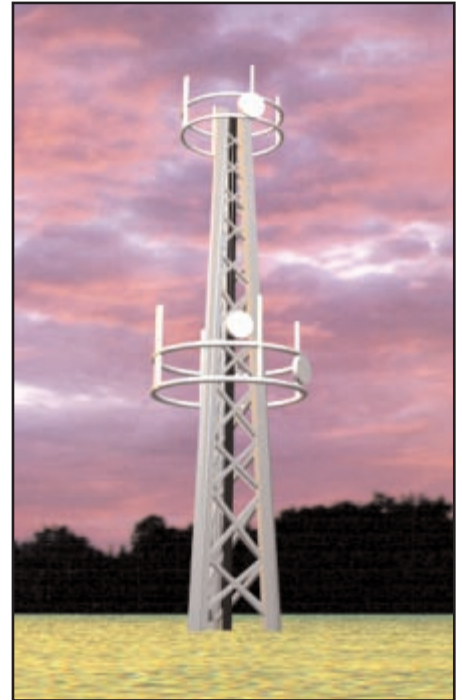
TOWER STRUCTURE EXAMPLES



WIND TURBINES



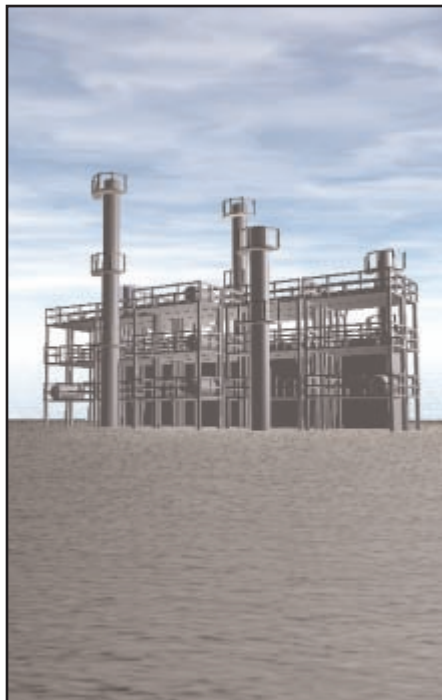
HYDRO INSTALLATIONS



COMMUNICATIONS



CRANE OPERATIONS



INDUSTRIAL/REFINERY



PETROCHEMICAL

TECHNICAL DATA

Cage

Working Load: 550 lbs (250 kg) or two persons.

Total weight: 880 lbs (400 kg).

Rated speed: 59 ft/minute (18 m/minute).

Free space required (d x w): 4'-9" x 2'-9" (1450 mm x 860 mm).

Exterior cage size (w x d x h): 1'-11-5/8" x 2'-5-1/2" x 6'-10-5/8" (600 mm x 750 mm x 2100 mm).

Upward-acting door opening: 1'-11-5/8" x 4'-7-1/8" (600 mm x 1400 mm).

Cage material: 6061-T6 mill finish aluminum walls and floor with seamless, brake shape vertical corner construction and support frame.

Traction hoist: Pro-Bel/Skyman H400E.

Emergency Ladder/Guide Rails

Aluminum Construction: Mill finish 6061-T6 alloy with stainless steel vertical lifeline for mobile runner lanyard attachment that can be hooked or unhooked at any location on cable.

Ladder support intervals: 15'-9" (4800 mm) on centers.

Maximum inclination: ±4° from vertical.

Working Height: Up to 492'- 0" (150 m).

Electrical

Overload detection: pilot light, alarm sounds.

Control systems (in cage and at base of tower): hold-to-run up and down, and emergency stop.

Electrical equipment protection: NEMA Type 3

Electrical equipment temperature range: -4°F to +104°F (-20°C to +40°C)

Power/voltage: 1.8 kW, 400V/60 Hz (other voltages/Hz available upon request).

Electrical equipment protection: NEMA Type 3.

Power cable (interior applications): AWG #14-2 up to 328'- 0" (100 m), and AWG #12-2 or #10-2 from 328'- 0" (100m) up to 492'-0" (150 m).

Power Conduction Rail (exterior applications): compact multiple conductor system with self-insulated, non-corrosive housing. Size and securement to suit application.

Accessories (included)

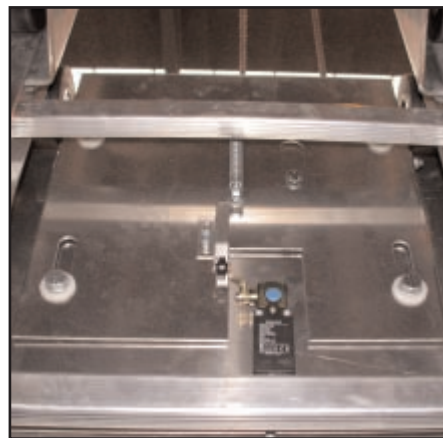
Full body safety harness: for Tower Hoist operator (double lanyard type; snap hook provided on one lanyard and ladder cable runner on other lanyard).



Worm's eye view of wind turbine tower hoist showing how support frame and undercarriage are secured to metal ladder.



Virtually unbreakable polycarbonate vision windows



Back of cage showing failsafe detection system and cut-out switch for ladder obstructions.



Control Panel and anchor eye attachment point for operator's safety harness when evacuating cabin in an emergency situation.



Overspeed safety brake inside cage. Pulling handle provides emergency descent at controlled speed in case of power failure.

INSTALLATION

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

Pro- Bel Tower hoists can be installed onto existing metal tower ladders or new aluminum ladders fabricated by Pro- Bel.

HEAD AND BASE OPTIONS

Pro- Bel Tower Hoists have been designed for all types of tower applications provided they do not exceed a maximum inclination of $\pm 4^\circ$ from vertical. Illustrations on this page show a variety of head and base options.



Example method of securing primary and secondary suspension cables at top of tower (interior of wind turbine). Weight at bottom keeps ropes under tension.



Base of emergency ladder/guide rails showing securement to metal landing. Note guide wheels attached to cage frame that hold and stabilize the cage along both sides of the ladder.



Base of emergency ladder/guide rails showing securement to concrete landing.



Example of cage arriving at base of tower into security enclosure (by others).

INSPECTION & MAINTENANCE

Tower Hoists that are supplied and installed must be inspected annually as a minimum requirement. OSHA addresses the annual inspections through the enforcement of the General Industry and Duty clause, Section 5(a)(1) of the OSHA act.

OSHA Inspection Requirements

Tower Hoists shall be inspected and tested (as required) prior to initial use to determine that all safety and operating equipment is functioning as required. A similar inspection shall be made following any major alteration to the existing installation.

All equipment and related components shall undergo periodic inspections by a competent person at intervals specified by the manufacturer/supplier, but not to exceed twelve (12) months, to determine that they are in safe operating condition. Parts subject to wear such as wire ropes, shall be inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation.

The tower owner shall keep a certification record of each inspection and test required. The certification record shall include the date of the inspection, the signature of the person who performed the inspection, and the number, or other identifier, of the support structure and equipment which was inspected. This certification record shall be kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer.

Pro- Bel Inspection Services

Pro-Bel offers owners/employers two inspection options. Inspections may be carried out using a Pro-Bel inspector 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 Tower Hoist installations. All inspection data is recorded in the tower 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 reduce both the design professional's and owner's legal exposure in the event of an accident.

Special Note: Pro-Bel customers automatically receive \$2,000,000.00 liability insurance coverage providing the foregoing conditions are met.

Posting of Engineered Drawings

It is recommended that the tower owner post a copy of the Pro-Bel engineer approved shop drawing showing equipment layout and details of the Tower Hoist system. The drawing should be located adjacent to the base of the tower in a protected plastic enclosure for ease of review by facilities management, maintenance personnel, inspection authorities, and Pro- Bel if necessary. A copy of this drawing must also be provided for the maintenance contractor/personnel prior to commencing work.

AVAILABILITY & COST

Available throughout North America and Internationally. Contact Pro- Bel for current pricing.

WARRANTY

Normal one year against faulty materials.

TECHNICAL CONSULTATION

Pro-Bel Enterprises Limited provides a complete technical consultation service, available to engineers, design authorities, contractors, and facilities owners. Without obligation, Pro-Bel will provide interested parties with a proposed Tower Hoist design concept to OSHA requirements, including anchor and equipment locations, securement, and specifications.



Pro-Bel TH250-U Tower Hoist Personnel Cage used in exterior application. Note cover on top to protect electrical components and power conductor rail instead of trailing supply cable.

SPECIFICATION

SPEC NOTE: The following specification is arranged as a separate section of work under "fixed hoists" in the following types of specifications:

- civil engineering, infrastructure;
- structural engineering;
- mechanical and electrical engineering;
- telecommunications;
- process engineering;
- and similar specifications.

The specification is written in accordance with the CSI/CSC Three Part Section Format and must be adapted to suit the requirements of individual projects. 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 tower hoist personnel cage maintenance equipment.

1.03 Related Sections By Others

- A. Cast-in-place concrete, including installation of embedded items
- B. Structural steel
- C. Catwalks
- D. Roofing
- E. Flashing
- F. Sealants
- G. Electrical power supply

SPEC NOTE: Re 1.03.H. Specify independent protected main line power 400 volts, 3 phase, 60 Hertz, 1.8 kW receptacle. Use standard Hubbell Twist-Lock for indoor applications and weatherproof Hubbell Twist-Lock receptacle for outdoor applications. Power to be located no more than 100'-0" (30 m) from tower hoist location. Outlets to experience no more than 3% voltage drop under full load. Pro-Bel wall or roof anchors may be employed for strain relief. Contact Pro-Bel for requirements.

- H. Power Supply outlets with strain relief anchors.

1.04 References

- A. Aluminum Association AA ADM-1 Aluminum Design Manual, 2000.
- B. AWS D1.2-97 Structural Welding Code - Aluminum.
- C. AWS D1.1-2000 Structural Welding Code - Steel.

1.05 Design Requirements

- A. Design tower hoist to suit tower structure and in accordance with plans, specifications, standards, and regulations/codes contained in section 1.04 and 1.08.
- B. Locate anchorages to suit suspension equipment which will be used on the tower structure with respect to items such as reach, rigging, spacing, and similar items.
- C. Design all anchor components to provide adequate attachment to the tower structure and suited to current 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 suspended maintenance equipment, its application and safety requirements.
- E. Design system equipment supports to comply with the following structural requirements:
 - 1. Supports for tower hoist: structural members are used for suspending a powered tower hoist from a rigging location on the tower. 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).

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

1.06 Shop Drawings and Engineering Certification

- A. Submit shop drawings showing complete layout and configuration of tower hoist, including all components and accessories. Clearly indicate design and fabrication details, glazed areas, 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 or test reports.

1.07 Qualifications

- A. Manufacturer: Work of this Section to be executed by a manufacturer specializing in the design, fabrication and installation of 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 welders certified 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 F (Powered Platforms).
 - 2. Appendix C to 1910 (Personal Fall

Arrest Systems).

- 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.
- C. Comply with the following California State regulation:
 - 1. Code of Regulations, Title 8 - Industrial Relations, 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 at the base of the tower.

PART 2 - PRODUCTS

2.01 Manufacturer

- A. 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.
- 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 engineer and/or consultant.

2.02 Equipment

Spec Note: List type and quantity of Tower Hoists as required.

- A.
- B.

2.03 Materials

SPEC NOTE: Delete items not required.

- A. Tower Hoist: Pro- Bel electric [TH250] [TH250-U] Tower Hoist Personnel Cage, fully enclosed type manufactured using 6061-T6 mill finished aluminum complete with two rope suspension system suitable for mounting to [existing metal ladder][new aluminum emergency ladder].
- B. Cage: .064" (2 mm) thickness seamless corner construction 1'-11-5/8" width x 2'-5-1/2" depth x 6'-10-5/8" high (600 mm x 750 mm x 2100 mm) exterior dimensions with aluminum floor, perforated upward

acting aluminum door measuring 1'-11-5/8" x 4'-7-1/8" (600 mm x 1400 mm) having finger groove on crossbar, 3/16" (5 mm) thickness support frame, and 1/2" (12 mm) thickness high impact resistant polycarbonate viewing windows on 3 sides and in roof of cage, and the following characteristics:

1. Total weight: 880 lbs (400 kg);
2. Rated speed: 59 ft/min. (18m /min.);
3. Stainless steel safety anchor eye for operator's lanyard attachment;
4. Control system (in cage and base of tower): hold-to-run "up", "down," and "emergency stop";
5. Manually operated emergency descent control;
6. Pro-Bel/Skyman H400E traction hoist mounted on top of cage that climbs a 5/16" (8 mm) primary galvanized steel suspension wire rope;
7. Mounted inside the cage, provide a secondary overspeed safety brake operating on a secondary 5/16" (8 mm) dia. galvanized steel wire rope;
8. A cable weight at the base of the tower to keep the wire ropes under tension;
9. A pull handle in the cage to provide emergency descent at a controlled speed in case of a power failure;
10. Failsafe detection and cut-out switch to detect any obstruction on the ladder;
11. Overload detection system;
12. Four (4) sets of dual guide wheels to hold and stabilize the cage on both sides of the emergency ladder/guide rails while ascending and descending;

SPEC NOTE: Specify item 13 for outdoor applications (TH250-U).

13. Aluminum cover on top of cage to protect electrical components;
14. Upper and lower limit switches;
15. Interlock switch for closed door to prevent tower hoist from operating if door is in open position;
16. Trailing power supply cable, [AWG #14-2 for travel up to 328'-0" (100 m)] [AWG #12-2 or #10-2 for travel from 328'-0" (100 m) to 492'-0" (150 m)].
17. NEMA Type 3 electrical equipment protection.

SPEC NOTE: Specify item 18 for outdoor applications (TH250-U)

18. Power conductor rail of compact multiple system with self insulated, non-corrosive housing, of size and securement to suit application.

C. Traction Hoist: Pro-Bel/Skyman H400E electric traction hoist, [400V/60 Hz], 1.8 kW, with the following characteristics:

1. Modular construction for ease of maintenance;
2. Self reeving;
3. Motor protection against overheating;
4. Light weight;
5. Failsafe primary brake;
6. Low current draw;
7. Low rope-wear factor;
8. Independent secondary overspeed brake;
9. Emergency descent.

SPEC NOTE: Specify aluminum ladder for new construction only.

D. Aluminum ladder/guide rails: 6061-T6 alloy with mill finish, 18-5/8" (472 mm) wide with rungs spaced 12" (300 mm) on center. Side rails to consist of I-sections 2-1/2" x 1-3/8" (62 mm x 36 mm) complete with snap on cover strips. Distance between substrate supports not to exceed 15'-9" (4800 mm). Ladder fastening to suit substrate.

E. Ladder mounted fall arrest vertical lifeline: Pro-Bel/Vertic 5/16" (8 mm) dia. AISI 316L s.s. single length of cable of min. 4.50 ton-force (40 kN) breaking load; cable to be fixed in center of the ladder, complete with:

1. S. S. mobile fall arrest runner attached to operator's lanyard that can be hooked or unhooked at any point on the cable and that allows the user to travel vertically up or down without any constraint or unwanted blocking, except when a fall occurs, or after a voluntary action by the user to stay temporarily (to work or rest). A simple pulling up action shall unlock the system.

SPEC NOTE: If ladder width is less than 12" (300 mm) specify cable system to be installed on right side of ladder to allow enough space for user's feet.

2. Stainless Steel anchorage devices with upper bracket swaged in the factory, lower bracket with tension control device,

tensioning screw, U-bolt, and intermediate brackets fixed at approximately 20'-0" (6 m) centers.

- F. Fall arrest harness: [One only][two total] double lanyard type with back attachment point and clip on lanyard for securing to anchor eye on inside of cage, and front attachment point and CMB runner on lanyard for securing to ladder cable.

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 or 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.

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

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

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

D. Manufacturer to assist and/or supervise installation of tower hoist maintenance equipment installed by others.

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.

SERVING U.S.A. AND CANADA, COAST TO COAST.

PRO-BEL ENTERPRISES LIMITED

Head Office

765 Westney Road S,
Ajax, ON CA L1S 6W1
[t] 905.427.0616
[ft] 800.461.0575
[f] 905.427.2545
[e] info@pro-bel.ca

Western Office

#103-350, East Kent Ave S
Vancouver, BC V5X 4N6
[t] 604.687.1301
[ft] 604.687.1306
[e] infovan@pro-bel.ca

Member of



www.pro-bel.ca

PRO-GRESS • PRO-BEL