SECTION 05 73 00

STAINLESS STEEL WIRE ROPE RAILING SYSTEMS

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\*\* NOTE TO SPECIFIER \*\* Jakob Rope Systems; Horizontal and vertical stainless steel balustrade and infill wire rope systems.  
 .  
 This section is based on the products of Jakob Rope Systems, which is located at:  
2665 N.W. 1st Ave.  
Boca Raton, FL 33431  
Toll Free Tel: 866-215-1421  
Tel: 561-330-6502  
Fax: 561-330-6508  
Email: [request info (info@jakob-usa.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Jakob+Rope+Systems&coid=42721&rep=&fax=561-330-6508&message=RE:%20Spec%20Question%20(05720jak):%20%20&mf=)  
Web: <https://www.jakob-usa.com>   
[ [Click Here](http://www.arcat.com/arcatcos/cos42/arc42721.html) ] for additional information.  
   
 Jakob products are manufactured in Switzerland using only high-quality AISI 316. Whether your project needs stainless steel fittings, stainless steel fasteners or any stainless steel hardware, you won't find a better product anywhere in the world.  
   
 This section includes stainless steel railing balustrades and guardrail created with our wire rope wire mesh netting, rods, fittings, and other INOX Line components manufactured by Jakob, Inc.. Components provided by Jakob, Inc. are fabricated from chromium-nickel austenitic stainless steel with low carbon content and containing molybdenum for greater corrosion resistance. These stainless steel, corrosion resistant, low maintenance, high tensile strength products provide design flexibility, durability, high strength to weight ratio, functionality, and impressive aesthetics.  
   
 In business for over 100 years in 58 different countries, we have the experience to help you get the job done the right way. Remember, "If you can think it, Jakob can help you create it."  
 .

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Horizontal wire rope railing infill system.
    2. Vertical wire rope railing infill system.
    3. Vertical stainless steel rods.
    4. Stainless steel netting.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 03 30 00 - Cast-in-Place Concrete.
    2. Section 04 40 00 - Stone Assemblies.
    3. Section 05 50 00 - Metal Fabrications.
    4. Section 05 51 33 - Metal Ladders.
    5. Section 05 52 17 - Roof Fall Protection.
    6. Section 06 20 00 - Finish Carpentry.
    7. Section 06 43 13 - Wood Stairs.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American Iron and Steel Institute (AISI) - Steel Product Manual; Stainless and Heat Resisting Steel.
    2. ASTM A 276 - Stainless and Heat-Resisting Steel Bars and Shapes.
    3. ASTM A 380 - Practice for Cleaning and Descaling Stainless Steel Parts, Equipment and Systems.
    4. ASTM A 492 - Specification for Stainless Steel Rope Wire.
    5. ASTM A 555 - Stainless Steel Wire.
    6. ASTM A 582 - Specification for Free-Machining Stainless and Heat-Resisting Steel Bars.
    7. ASTM B 912 - Specification for Passivation of Stainless Steels Using Electropolishing.
    8. ASTM E 935 - Permanent Metal Railing Systems and Rails for Buildings.
    9. ASTM E 985 - Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
    10. ASTM F 1145 - Specification for Turnbuckles, Swaged, Welded, Forged.
    11. MIL-C-5688 - Pre-Stretching and Proof-Testing of Wire Rope Assemblies.
  1. DESIGN / PERFORMANCE REQUIREMENTS

\*\* NOTE TO SPECIFIER \*\* It is the Architect's responsibility to design the stainless steel wire rope railings including supporting posts, frames, and anchorage method to comply with applicable codes and regulations. Consult load tables contained in the manufacturers product data for required data. The following paragraphs identify typical code conditions, edit as required to suit actual requirements. Delete if data is indicated on the Drawings.

* + 1. Structural Requirements: Provide wire rope railings systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated on the Drawings:
       1. Handrails:
          1. Uniform load of 50 lbs/ft. (0.73 kN/m) applied in any direction.
          2. Concentrated load of 200 lbs/ft (0.89 kN) applied in any direction.
          3. Uniform and concentrated loads need not be assumed to act concurrently.
       2. Top Rails of Guards:
          1. 50 lbs/ft. (0.73 kN/m) applied horizontally and concurrently with 100 lbs/ft. (1.46 kN/m) applied vertically downward.
          2. Concentrated load of 200 lbs/ft (0.89 kN) applied in any direction.
          3. Uniform and concentrated loads need not be assumed to act concurrently.
       3. Infill of Guards:
          1. Concentrated load of 200 lbs/ft (0.89 kN) applied horizontally on an area of 1 SF (0.093 sm).
       4. Railing shall comply with all requirements of the ADA and OSHA regulations.

\*\* NOTE TO SPECIFIER \*\* It is the Architect's responsibility to design the stainless steel wire rope railings including the height of railings, size and clearance of handrails, size of openings in guardrails, and other attributes to comply with applicable codes and regulations. The following paragraphs identify typical code conditions, edit as required to suit actual requirements. Delete if data is indicated on the Drawings.

* + 1. Wire rope railing systems shall be designed, fabricated, and installed to comply with applicable codes and regulations.
       1. Minimum guardrail height: 42 inches (1067 mm).
       2. Maximum opening in guardrail: Shall restrict 4 inches (102 mm) diameter sphere.
       3. Handrail diameter: 1-1/4 inches (32 mm) minimum and 2 inches (51 mm) maximum.
       4. Handrail clearance from wall: 1-1/2 inches (38 mm) minimum.
    2. Wire rope railing systems shall be designed, fabricated, and installed to accommodate expansion and contraction of metal components without causing undue stress, buckling, opening of joints, and distortion.
    3. Design supports and hardware to withstand loads encountered without excessive deflection or distortion when cables are tensioned to required amounts required to conform to applicable building codes.
    4. Exposed fasteners shall be of same materials, color and finish as material to which applied. Exposed surfaces throughout project shall have same inherent texture and color for similar locations.
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00.
     2. Product Data: Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards. Provide list of fittings being provided with descriptions, load capabilities, and either photographs or drawings for each type.
     3. Shop Drawings: Submit Shop Drawings for fabrication and installation. Include the following:
        1. Plans, elevations, and detail sections.
        2. Indicate materials, methods, finishes, fittings, fasteners, anchorages, and accessory items.
        3. Provide setting diagrams and templates for anchorages, sleeves, and bolts to be installed by others.
        4. Where materials or fabrications are indicated to comply with design loadings, include material and safety factor properties, and other information needed for structural analysis.
     4. Verification Samples: Two samples representing actual products and finishes as follows:
        1. Wire rope with fitting, minimum size 12 inches (300 mm) long.
        2. Typical fittings.
     5. Installation Instructions: Manufacturer's printed installation instructions.
     6. Operation and Maintenance Data: Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
     7. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
  2. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Company specializing in manufacturer of stainless steel wire rope, fittings, and other stainless steel components with 10 years minimum successful experience.
     2. Installer Qualifications: Experienced in performing work of this section that has specialized in installation of work similar to that required for this project.

\*\* NOTE TO SPECIFIER \*\* Include a mock-up if the project size and/or quality warrant taking such a precaution. The following is one example of how a mock-up on a large project might be specified.

* + 1. Mock-Up: Provide a mock-up for evaluation of preparation techniques and installation workmanship.
       1. Locate in areas designated by Architect.
       2. Size: Minimum of 8 LF (2.4 lm).
       3. Do not proceed with remaining work until workmanship is approved by Architect.
       4. Rework mock-up as required to produce acceptable work.
       5. Retain mock-up during construction as quality standard.

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two choices for final disposition of mock-up.

* + - 1. Remove and legally dispose of mock-up when no longer needed.
      2. Incorporation: Incorporate mock-up into final construction.
    1. Preinstallation Meetings: Conduct meetings including Contractor, Architect, fabricator, installer and other subcontractors whose work involves cable railing system to verify project requirements, framing and support conditions, mounting surfaces and manufacturer's installation. Comply with Division 1 requirements.
  1. DELIVERY, STORAGE, AND HANDLING
     1. Store products in manufacturer's unopened packaging until ready for installation.
     2. Handle and store products according to manufacturer's recommendations. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.
     3. Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, and installation.
  2. PROJECT CONDITIONS
     1. Verify actual openings by field measurements before fabrication; show recorded measurements on shop drawings.
     2. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Jakob Rope Systems, which is located at: 2665 N.W. 1st Ave.; Boca Raton, FL 33431; Toll Free Tel: 866-215-1421; Tel: 561-330-6502; Fax: 561-330-6508; Email: [request info (info@jakob-usa.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Jakob+Rope+Systems&coid=42721&rep=&fax=561-330-6508&message=RE:%20Spec%20Question%20(05720jak):%20%20&mf=); Web: <https://www.jakob-usa.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.
    3. Provide all cable, materials, fittings and components from a single manufacturer.

\*\* NOTE TO SPECIFIER \*\* Select wire rope paragraph(s) required and delete those not required. 6x7 wire rope is used for most railing applications due to ease of use and flexibility to accommodate stairs and curves. 1x19 has higher tensile capacity and is more resistant to bending and deformation under load. Typically 3 mm (1/8 inch) to 6 mm (1/4 inch) is used for cable infill. The type and size of wire rope to be used can be selected by Architect from Jakob product literature and load tables. Contact Jakob for assistance in determining the correct cable size and end fittings for your application.

* 1. WIRE ROPE
     1. Material: ASTM A 492 and ASTM A 555, Type 316 stainless steel. Fabricate wire rope with integral colored filament designating specific manufacturer.
     2. Type 1: \_\_ x \_\_ wire rope; INOX No. \_\_\_\_\_ as manufactured by Jakob, Inc.

\*\* NOTE TO SPECIFIER \*\* Stainless steel wire and rope varies from 3/64 inch (1 mm) diameter to 1 inch (26 mm) diameter.

* + - 1. Diameter: \_\_\_\_ inches ( \_\_\_ mm).
      2. Breaking load including safety factor: \_\_\_\_\_ pounds ( \_\_\_ kg) minimum.

\*\* NOTE TO SPECIFIER \*\* Use the following paragraphs if more than one size and type of wire rope is required. Delete if not required.

* + 1. Type 2: \_\_ x \_\_ wire rope; INOX No. \_\_\_\_\_ as manufactured by Jakob, Inc.
       1. Diameter: \_\_\_\_ inches ( \_\_\_ mm).
       2. Breaking load including safety factor: \_\_\_\_\_ pounds ( \_\_\_ kg) minimum.
    2. Type 3: \_\_ x \_\_ wire rope; INOX No. \_\_\_\_\_ as manufactured by Jakob, Inc.
       1. Diameter: \_\_\_\_ inches ( \_\_\_ mm).
       2. Breaking load including safety factor: \_\_\_\_\_ pounds ( \_\_\_ kg) minimum.
    3. Length: Provide wire rope tendons in lengths indicated on Drawings and approved shop drawings.
       1. Provide optimum adjustment in both directions by calculating final tendon lengths with allowance for tensioning fittings with 2/3 open and with 1/3 of thread length engaged.
       2. Measure tendon length from center of pin to center of pin, or center of eye to center of eye.

\*\* NOTE TO SPECIFIER \*\* Wire netting is a flexible, extendable, stainless steel wire mesh that when stretched between perimeter supports accommodates stretch and tension forces in three dimensions. Use the following paragraphs if Webnet is to be used as infill for guardrails. Delete if not required.

* 1. WIRE NETTING
     1. Material: Webnet as manufactured by Jakob, Inc. Parallel stainless steel wire ropes connected by reciprocally curved offset sleeves or clamps such that ropes are neither knotted nor crossed. Wire rope shall be fabricated from cold-drawn, AISI Type 316 stainless steel wire complying with ASTM A 492 and ASTM A 555.

\*\* NOTE TO SPECIFIER \*\* The type and size of wire netting to be used can be selected by Architect from Jakob product literature and load tables. Contact Jakob for assistance in determining the correct cable size and end fittings for your application.

* + 1. Type 1: Webnet No. \_\_\_\_\_ as manufactured by Jakob, Inc.

\*\* NOTE TO SPECIFIER \*\* Stainless steel wire and rope varies from 3/64 inch (1 mm) diameter to 1 inch (26 mm) diameter.

* + - 1. Diameter: \_\_\_\_ inches ( \_\_\_ mm).
      2. Breaking load including safety factor: \_\_\_\_\_ pounds ( \_\_\_ kg) minimum.

\*\* NOTE TO SPECIFIER \*\* Use the following paragraphs if more than one size and type of wire rope is required. Delete if not required.

* + 1. Type 2: Webnet No. \_\_\_\_\_ as manufactured by Jakob, Inc.
       1. Diameter: \_\_\_\_ inches ( \_\_\_ mm).
       2. Breaking load including safety factor: \_\_\_\_\_ pounds ( \_\_\_ kg) minimum.
    2. Type 3: Webnet No. \_\_\_\_\_ as manufactured by Jakob, Inc.
       1. Diameter: \_\_\_\_ inches ( \_\_\_ mm).
       2. Breaking load including safety factor: \_\_\_\_\_ pounds ( \_\_\_ kg) minimum.

\*\* NOTE TO SPECIFIER \*\* Select the perimeter configuration required from the following paragraphs. Webnet can be installed vertically or horizontally and with numerous perimeter conditions to accommodate various attachment methods. Vertically installed mesh is less susceptible to climbing. Refer to Jakob product literature for diagrams and descriptions of the perimeter configurations available.

* + 1. Perimeter configurations:
       1. Perimeter Type No. \_\_\_\_\_ as manufactured by Jakob, Inc.
          1. Open.
          2. Closed with uncompressed sleeves.
          3. Closed with eye ends.
          4. Suitable for:

Vertical installation.

Horizontal installation.

\*\* NOTE TO SPECIFIER \*\* Use the following paragraphs if more than one size and type of perimetr configuation is required. Delete if not required.

* + - 1. Perimeter Type No. \_\_\_\_\_ as manufactured by Jakob, Inc.
         1. Open.
         2. Closed with uncompressed sleeves.
         3. Closed with eye ends.
         4. Suitable for:

Vertical installation.

Horizontal installation.

\*\* NOTE TO SPECIFIER \*\* Guardrails can be infilled with vertical solid stainless steel rod spindles. Edit and include this article if rod spindles required. Contact Jakob for assistance in determining the correct rod size and end fittings for your application. Delete if not required.

* 1. STAINLESS STEEL RODS
     1. Rod spindles: Solid stainless steel rods, AISI Type 316 complying with ASTM A 276.

\*\* NOTE TO SPECIFIER \*\* Stainless steel rods are available in eight standard diameter sizes as listed in the following paragraph. Select the diameter required and delete those not required.

* + 1. Size:
       1. Diameter: 1/4 inch (6 mm).
       2. Diameter: 5/16 inch (8 mm).
       3. Diameter: 3/8 inch (10 mm).
       4. Diameter: 15/32 inch (12 mm).
       5. Diameter: 5/8 inch (16 mm).
       6. Diameter: 25/32 inch (20 mm).
       7. Diameter: 7/8 inch (22 mm).
       8. Diameter: 15/16 inch (24 mm).
       9. Lengths as indicated on the Drawings.

\*\* NOTE TO SPECIFIER \*\* Stainless steel rods can be shop swaged with end connectors or rolled with external threaded connectors for on-site attachment. Select the rod termination required and delete those not required.

* + 1. Rod termination:
       1. External threads for on-site attachment.
       2. Swaged with end connector fittings.

\*\* NOTE TO SPECIFIER \*\* Guardrails and infill require fittings for attachment and connection of stainless steel wire rope wire netting and metal rods to support framework and substrates. Edit the following paragraphs as required. Contact Jakob for assistance in determining the correct end fittings for your application.

* 1. FITTINGS
     1. Provide fittings required for attachment and connection of stainless steel wire rope and infill to support framework and substrates.

\*\* NOTE TO SPECIFIER \*\* Fitting strength is typically a percentage of the wire minimum breaking strength. Depending on type of fitting, breaking strength can vary from 40 to 120 percent of wire rope minimum breaking strength.

* + 1. Fitting minimum breaking strength:

\*\* NOTE TO SPECIFIER \*\* Refer to Jakob product literature for breaking strength of each type of fitting and edit and/or select one of the following paragraphs as required. Delete the paragraph not required.

* + - 1. \_\_\_\_\_ percent of wire rope minimum breaking strength.
      2. As selected by manufacture to suit application and design requirements specified.
    1. Types: Fabricate from AISI Type 316 and 316L stainless steel complying with ASTM F 1145; INOX Line Fittings as manufactured by Jakob, Inc. Provide sizes and types as required to meet project design conditions specified and indicated on Drawings and reviewed shop drawings including:

\*\* NOTE TO SPECIFIER \*\* Jakob, 1nc. manufactures numerous stainless steel fittings for wire rope ends, for attachment to different substrates, and for connecting wire rope segments. To ensure structural compatibility it is important the Jakob wire rope only be used with Jakob fittings. Typically required fittings will be determined by manufacturer to accommodate Project conditions and loadings. Edit the following to indicate basic type of fittings required for specific project. Delete the fitting type paragraphs not required.

* + - 1. Shop applied swaged rope ends: Threaded external and internal swivel ends, turnbuckles, tensioning screws, end stops, clevis ends, eye ends, loop ends, and end cones.
      2. Screwed rope ends for on-site assembly: Threaded external and internal swivel ends, turnbuckles, tensioning screws, end stops, clevis ends, eye ends, loop ends, and end cones.
      3. Clamps: Ring clamps, cross clamps, wire rope clamping cones, and connecting wire rope clamps.
      4. Post fittings: Straight, angled, and spherical
      5. Anchoring systems: Studs, clevis, eye end, eye bolt, slotted, spacer baskets, radial clevis holder, cross clamp with support disk, slotted rope deflector, ball cage.
    1. Accessories: Provide threaded couplings, tensioning screws, cover disks, eye bolts, eye nuts, carabiners, shackles, clips, welded rings, screws, washers, lock nuts, hexagonal nuts, dome nuts, wall anchors, screws, and wire endcaps as required to complete the installation.
  1. FINISH
     1. After fabrication, clean and de-scale stainless steel wire rope, fittings, and other components in accordance with ASTM A 380.
     2. Finish components with AISI No. 4 brushed satin finish in accordance with ASTM B 912.
  2. FABRlCATlON
     1. Tolerances: Verify dimensions on site prior to shop fabrication.
     2. Fabricate stainless steel in accordance with AISI Steel Product Manual and the manufacturers requirements.
     3. Shop fabricate to designs indicated on Drawings and to meet performance requirements specified.
     4. Shop fabricate fittings, interfacing parts and assemblies so that field cutting adjustments are not necessary.
     5. Coordinate requirements, dimensions and spacings of wire rope railing system to ensure required factory drilled holes in supporting framework are correctly located.
     6. Make exposed joints butt, flush, and hairline.

1. EXECUTION
   1. EXAMINATION
      1. Before beginning installation, verify that conditions installed under other sections are acceptable for installation of cable railing systems in accordance with manufacturer's installation instructions.
      2. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate Sections.
      3. Verify supporting posts and framework for stainless steel wire rope railings are prepared for attachment of anchors, fittings, wire rope, and wire netting and transfer of calculated loads.
      4. If conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
   2. PREPARATION
      1. Verify alignment, support dimensions, and tolerances are correct.
      2. Inventory components to ensure all required items are available for installation. Inspect components for damage. Remove damaged components from site and replace.
   3. INSTALLATION
      1. Install wire rope infill system in accordance with manufacturer's instructions and the approved shop drawings.
      2. Provide anchorage devices and fittings to secure to in-place construction; including threaded fittings for concrete inserts, toggle bolts and through-bolts.
      3. Install wire rope infill system plumb, level, square, and rigid without kinks or sags.
      4. Anchor wire rope railing system to mounting surfaces as indicated on the drawings.
      5. Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion.
      6. Use manufacturer's supplied cable hardware.
      7. Ensure cables are clean, parallel to each other, and without kinks or sags.
      8. Tension cable with hand or hydraulic equipment so that no slack is visible.
      9. After final adjustment provide tamper resistant locktight materials on all fittings.
   4. ADJUSTING AND CLEANING
      1. Adjust wire rope tension and connecting hardware.
      2. Remove temporary coverings and protection of adjacent work areas. Clean installed products in accordance with manufacturer's instructions before owner's acceptance.
      3. Do not use abrasive cleaners.
      4. Remove from project site and legally dispose of construction debris associated with this work.
   5. PROTECTION
      1. Protect installed products until completion of project.
      2. Touch-up, repair or replace damaged products before Substantial Completion.
      3. Protect installed products and finished surfaces from damage during construction.
      4. Replace defective or damaged components as directed by Architect.
      5. Repair damaged factory-applied finish as directed by Architect.

END OF SECTION