



SECTION 05523 (05 52 00)

SAFETY RAILING SYSTEMS

**NOTE TO SPECIFIER:** Kee Safety, Inc.; pipe railing fittings, safety railing systems, deadweight anchor systems, skylight fall protection, horizontal lifeline systems.

*This section is based on the products of Kee Safety, Inc., which is located at:*

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Buffalo, NY 14206

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Kee Safety is the world's leading fall protection expert. We engineer, manufacture, supply and install Fall Protection Systems that safely separate people from hazards. Since 1934, Kee Safety has provided versatile, economical, and durable safety railing components and modular systems that consistently meet OSHA compliance on rooftop applications and ground-based installations. Kee Safety products are third-party tested and trusted to ensure consistent performance at the highest level.

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Steel safety rail components. (KEE KLAMP)
- B. Aluminum Safety Railings. (KEE LITE)
- C. Steel ADA Safety Railing Components. (KEE KLAMP ACCESS)
- D. Safety Railing Kits. (KEE KWIK)
- E. Custom railing systems.

1.2 RELATED SECTIONS

Section 05500 - Metal Fabrications: Associated metal supports.

- A. Section 07400 - Membrane Roofing: Coordination of roof edge protection installation.

1.3 REFERENCES

- A. Americans with Disabilities Act Accessibility Guidelines (ADA).
- B. American Society of Civil Engineer (ASCE):
  - 1. ASCE 7-16 - Minimum Loads and Associated Criteria for Buildings and Other Structures.
- C. ASTM International (ASTM):
  - 1. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.

2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  3. ASTM A123 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Products.
  4. ASTM A500 - Standard Specification for cold-formed welded and seamless carbon steel structural tubing.
  5. ASTM B221 - Standard Specification for Aluminum and Aluminum Alloy extruded bars, rods, wires, profiles, and tubes.
- D. Occupational Safety and Health Administration (OSHA):
1. OSHA 1910.29 - Fall Protection systems and falling object protection.
  2. OSHA 1926.502 - Fall Protection systems criteria and practices.
- E. Underwriters Laboratories (UL): UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Installation methods.
- C. Shop Drawings: Including but not limited to indication of profiles, sizes, connections, sizes and types of fasteners and accessories; showing fabrication and installation of handrails and guardrails including but not limited to plans, elevations, sections, details of components, anchor details, and attachment to adjoining units of work.
- D. Selection Samples: For each system specified, two complete sets of color chips representing manufacturer's full range of available finishes.
- E. Verification Samples: For each system specified, two samples, minimum size 6 inches (150 mm) long, representing actual system components and finishes.

#### 1.5 QUALITY ASSURANCE

- A. Railings Structural Requirements:
- Handrail, wall rail and guardrail assemblies and attachments shall withstand a minimum concentrated load of 200 lbs (90,719 g) applied horizontally or vertically down at any point on the top rail.
1. Handrail assemblies and guards shall be designed to resist a load of 50 lbs per linear ft (0.73 kN per m) applied in any direction at the top and to transfer this load through the supports to the structure.
  2. Infill area of guardrail system capable of withstanding a horizontal concentrated load of 200 lbs (90719 g) applied to 1 sq ft (8165 g per sq m) at any point in the system. Load not to act concurrently with loads on top rail of system in determining stress on guardrail.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Install in areas designated by Architect.
  2. Do not proceed with remaining work until workmanship and installation are approved by Architect.
  3. Refinish mock-up area as required to produce acceptable work.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, Store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards. Store materials within absolute limits for temperature and humidity recommended by the manufacturer.
  - 1. Materials to be delivered to the job site in good condition and adequately protected against damage as handrails are a finished product.
  - 2. Store products in manufacturer's unopened packaging until ready for installation.
  - 3. Protect finishes from damage.

## 1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings.
  - 1. Where field measurements cannot be made without delaying the railing fabrication and delivery, obtain guaranteed dimensions in writing by the Contractor and proceed with fabrication of products to not delay fabrication, delivery, and installation.
- C. Coordinate fabrication and delivery schedule of handrails with construction progress and sequence to avoid delay of railing installation.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Kee Safety, Inc., which is located at: 100 Stradtman St.; Buffalo, NY 14206; Toll Free Tel: 800-851-5181; Tel: 716-896-4949; Fax: 716-896-5696; Email: info@keesafety.com; Web: http://keesafety.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with the provisions of Section 01600.

### 2.2 SAFETY RAILINGS PERFORMANCE AND DESIGN REQUIREMENTS

- A. Performance and Design Requirements: Pipe and tube railing and guardrail design.
  - 1. Comply with the following:
    - a. International Building Code/International Code Council.
    - b. OSHA Standard Pipe Railing: 1910.29 Fall Protection systems and falling object protection.
    - c. Local code requirements by authorities having jurisdiction.
  - 2. Delegated Design: Railing design is to be the responsibility of a professional engineer, licensed in the same location as the project. See Section 014000 "Quality Requirements," for more detailed information.
  - 3. Requirements, for more detailed information.
  - 4. Structural Performance: Railings and Attachments: Withstand effects of gravity loads and the following loads as specified.
    - a. Recommended Maximum Post Spacing: 72 inches (1829 mm).
    - b. Minimum Height: 42 inches (1067 mm).
    - c. Intermediate Rail Height: 21 inches (533 mm).
    - d. Toe Board:
      - 1) Height: 4 inches (102 mm). 1/4 inch (6 mm) or less above the floor.
      - 2) Required wherever, beneath open sides, persons can pass, there is moving machinery, or there is equipment with which falling materials could



- discolorations.
  - 2. Fittings by Function:
    - a. Bases.
    - b. Clips.
    - c. Couplings.
    - d. Crosses.
    - e. Crossovers.
    - f. Elbows.
    - g. Flanges.
    - h. Swivel Sockets.
    - i. Tab Panels.
    - j. Tees and Sockets.
    - k. Plugs.
    - l. Miscellaneous.
- D. Material for Posts and Railings: KEE KLAMP.
1. Galvanized Steel Pipe or Tube: Nominal mill lengths of 21 feet (6.400 m). Galvanized steel tubing can be used, providing the outside diameter is compatible with Schedule 40 pipe. Pipe with a wall thickness of less than 1/8 inches (3.17 mm) can only be used in lightly loaded structures.
    - a. Pipe: Schedule 40 ASTM A53.
    - b. Pipe: Schedule 80 ASTM A53.
    - c. Tubing: ASTM A500 or ASTM A513.
    - d. Galvanizing: ASTM A123.
    - e. Nominal Pipe Size: 1/4 inch (6 mm). Outside Dia: 0.54 inches (13.7 mm).
      - 1) Tubing Outside Dia: 0.531 inches (13.49 mm).
      - 2) KEE Component Size: 2.
    - f. Nominal Pipe Size: 3/8 inch (10 mm). Outside Dia: 0.67 inches (17 mm).
      - 1) Tubing Outside Dia: 0.688 inches (17.47 mm).
      - 2) KEE Component Size: 3.
    - g. Nominal Pipe Size: 1/2 inch (13 mm). Outside Dia: 0.84 inches (21.3 mm).
      - 1) Tubing Outside Dia: 0.531 inches (13.49 mm).
      - 2) KEE Component Size: 4.
    - h. Nominal Pipe Size: 3/4 inch (19 mm). Outside Dia: 1.05 inches (26.7 mm).
      - 1) Tubing Outside Dia: 0.531 inches (13.49 mm).
      - 2) KEE Component Size: 5.
    - i. Nominal Pipe Size: 1 inch (25 mm). Outside Dia: 1.31 inches (33.3 mm).
      - 1) Tubing Outside Dia: 0.531 inches (13.49 mm).
      - 2) KEE Component Size: 6.
    - j. Nominal Pipe Size: 1-1/4 inch (32 mm). Outside Dia: 1.66 inches (42.2 mm).
      - 1) Tubing Outside Dia: 0.531 inches (13.49 mm).
      - 2) KEE Component Size: 7.
    - k. Nominal Pipe Size: 1-1/2 inch (38 mm). Outside Dia: 1.90 inches (48 mm) .
      - 1) Tubing Outside Dia: 0.531 inches (13.49 mm).
      - 2) KEE Component Size: 8.
    - l. Nominal Pipe Size: 2 inch (51 mm). Outside Dia: 2.37 inches (60.2 mm).
      - 1) Tubing Outside Dia: 0.531 inches (13.49 mm).
      - 2) KEE Component Size: 9.
    - m. Finish: Powder Coating: Durable, corrosion preventing polyester coating applied to already galvanized or anodized products available in any RAL color.
      - 1) Color: As determined by the Architect .
    - n. Finish: Antimicrobial Powder Coating: Defends against the growth of potentially harmful invisible bacteria and fungi. Supplied in a wide range of RAL colors.
      - 1) Color: As determined by the Architect.
- E. Accessories:

1. Anti-theft Aluminum Drive Rivets.
2. Toe Board.
3. Safety Spring Gate.
4. In-Fill Panels.
5. Grip Tape.
6. High Traction Covers.
7. High Traction Stair Covers.
8. High Traction Ladder Rung Covers.

#### 2.4 ALUMINUM SAFETY RAILINGS COMPONENTS – KEE LITE

- A. Basis of Design: KEE LITE Components and Pipe as manufactured by Kee Safety. Slip-on components to create versatile and rigid tubular system structures. The product line is to provide the versatility needed to achieve any structure configuration.
1. Handrails and guardrails.
  2. Roof hatch guardrails.
  3. Safety barriers.
  4. Roof edge protection.
- B. Performance and Design Requirements: Safety Railing Components: KEE LITE.
1. Fittings: High grade Aluminum Silicon Magnesium Alloy Fittings or Castings conforming to ASTM A356 T-6.
  2. Fittings Range: Eight different pipe sizes from 3/4 to 2 inches (19 to 51 mm).
  3. Hexagon Set Screws; Firmly lock components to pipes.
  4. Fittings Sizes 5 to 9:
    - a. Axial Load: Supports 2000 lbs (907 kg). per set screw tightened to 29 ft-lbs (39.3 N-m) torque.
      - 1) Safety factor of 2:1.
      - 2) Required Torque: Normally obtained when set screws are tightened using a ratchet wrench.
- C. Components: KEE LITE.
1. Fittings, Brackets, Flanges, and Anchors: Cast or formed metal of same material and finish as supported rails. Surfaces: Smooth. No seams, marks, trade names, or discolorations.
  2. Fittings by Function:
    - a. Bases.
    - b. Couplings.
    - c. Crosses.
    - d. Crossovers.
    - e. Elbows.
    - f. Flanges.
    - g. Handrail Wall Bracket.
    - h. Plugs.
    - i. Swivel Sockets.
    - j. Tees and Sockets.
    - k. Toe Board Kits.
    - l. Miscellaneous.

**\*\* NOTE TO SPECIFIER \*\*** When Kee Lite fittings in sizes 7, 8, 9 are used to construct a 42 inch (1067 mm) high guard railing, the railing will meet the requirements of the OSHA design standard of a single 200 lbs (90.7 kg) load applied at any location along the top rail when the correct specification of pipe is used, and the correct method of design is employed. The integrity of the structure to which the system is secured, and the hardware used will also need to be checked to ensure they are capable of meeting the imposed load requirements (reference OSHA 29 CFR 1910.29). Please contact Kee Safety for design assistance.

- D. Material for Posts and Railings: KEE LITE.

1. Aluminum Pipe: Alloy 6061-T6 conforming to ASTM B221.
  - a. Nominal Mill Length: 12 feet (3.658 m).
  - b. Nominal Mill Length: 24 ft (7.315 m).
  - c. Pipe: Schedule 40 ASTM B221.
  - d. Pipe: Schedule 80 ASTM B221.
  - e. Finish: Anodized.
    - 1) Color: As determined by the Architect.
  - f. Nom. Pipe Size: 3/4 inch (19 mm). Outside Dia: 1.050 inches (26.67 mm).
    - 1) KEE Component Size: 5.
  - g. Nom. Pipe Size: 1 inch (25 mm). Outside Dia: 1.315 inches (33.40 mm).
    - 1) KEE Component Size: 6.
  - h. Nom. Pipe Size: 1-1/4 inch (32 mm). Outside Dia: 1.660 inches (42.26 mm).
    - 1) KEE Component Size: 7.
  - i. Nom. Pipe Size: 1-1/2 inch (38 mm). Outside Dia: 1.900 inches (48.26 mm).
    - 1) KEE Component Size: 8.
  - j. Nom. Pipe Size: 2 inch (51 mm). Outside Dia: 2.375 inches (60.32 mm).

## 2.5 STEEL ADA SAFETY RAILINGS COMPONENTS – KEE KLAMP ACCESS

- A. Basis of Design: KEE KLAMP Components and Pipe as manufactured by KEE Safety. Slip-on components to create versatile and rigid tubular system structures. The product line with handrail height of 34" – 38" and guardrail height of 42" is designed to satisfy the requirements of the Americans with Disabilities Act (ADA), as well as state and local building codes.
- B. Performance and Design Requirements: Safety Railing Components: KEE KLAMP.
  1. Fittings: Iron castings manufactured to ASTM A47 Requirements.
    - a. Hot Dipped Galvanized: ASTM A123.
  2. Hexagon Set Screws; Firmly lock components to pipes.
    - a. Case hardened steel and protected against corrosion.
    - b. Corrosion Protection: KEE KOAT as manufactured by KEE SAFETY.
  3. Axial Load: Supports 2000 lbs (907 kg) per set screw tightened to 29 ft-lbs (39.3 N-m) torque.
    - a. Safety factor of 2:1.
    - b. Required Torque: Normally obtained when set screws are tightened using a ratchet wrench.
- C. Components: KEE KLAMP.
  1. Fittings, Brackets, Flanges, and Anchors: Cast or formed metal of same material and finish as supported rails. Surfaces: Smooth. No seams, marks, trade names, or discolorations.
  2. Fittings by Function:
    - a. Couplings.
    - b. Elbows.
    - c. Flanges.
    - d. Handrail Wall Bracket.
    - e. Tees and Sockets.
- D. Material for Posts and Railings: KEE KLAMP.
  1. Galvanized Steel Pipe: Nominal mill lengths of 21 feet (6.4 m).
    - a. Pipe: Schedule 40 ASTM A53.
    - b. Nom. Pipe Size: 1-1/4 inch (32 mm). Outside Dia: 1.660 inches (42.16 mm).
    - c. Finish: Powder Coating: Durable, corrosion preventing polyester coating applied to already galvanized or anodized products available in any RAL color.
    - d. Finish: Antimicrobial Powder Coating: Defends against the growth of potentially harmful invisible bacteria and fungi. Supplied in a wide range of RAL colors.
      - 1) Color: As determined by the Architect .

## 2.6 SAFETY RAILING KITS (KEE KWIK)

- A. Basis of Design: KEE KWIK KIT safety railing kits as manufactured by Kee Safety Inc.
1. Provide components including but not limited to pipe, fittings, and accessories as indicated or required to match design indicated on Drawings and to provide complete installation.
  2. Compliance: Safety barrier system with 42 inches (1067 mm) height to provide a pedestrian egress barrier to withstand a minimum load of 200 lbs (90.718 kg) in any direction to components per OSHA Regulation 29 CFR 1910.29.
  3. Fabrication: Preassembled upright modules.
  4. Pipe: 1.90 inches (48 mm) Outside Diameter.
  5. Rails and Posts: Safety yellow powder coated finish.
  6. Fittings: Galvanized malleable cast iron, ASTM A47 with ASTM A123 galvanizing.
  7. Fasteners: Type 304 or 305 stainless steel.
  8. Post Spacing: 72 inches (1829 mm).
  9. Type: Steel kit, Kwik SC Steel Corner Kit.
    - a. Description: Contains 3 pre-assembled 42 inch (1067 mm) uprights and 4 horizontal rails; 3 standard railing base flanges, 2 ninety degree elbows, 2 single socket tees, 1 side outlet elbow, and 1 ninety degree side outlet tee.
  10. Type: Steel kit, Kwik SE Steel Extension Kit.
    - a. Description: Contains 1 pre-assembled 42 inch (1067 mm) upright and 2 horizontal rails; 1 standard railing base flange, 1 three socket tee, and 1 two socket cross.
  11. Type: Steel kit, Kwik SS Steel Straight Kit.
    - a. Description: Contains 3 pre-assembled 42 inch (1067 mm) upright and 2 horizontal rails; 1 standard railing base flange, 1 three socket tee, and 1 two socket cross.
  12. Type: Aluminum kit, Kwik AC Aluminum Corner Kit.
    - a. Description: Contains 3 pre-assembled 42 inch (1067 mm) uprights and 4 horizontal rails; 3 standard railing base flanges, 2 ninety degree elbows, 2 single socket tees, 1 side outlet elbow, and 1 ninety degree side outlet tee.
  13. Type: Aluminum kit, Kwik AE Aluminum Extension Kit.
    - a. Description: Contains 1 pre-assembled 42 inch (1067 mm) upright and 2 horizontal rails; 1 standard railing base flange, 1 three socket tee, and 1 two socket cross.
  14. Type: Aluminum kit, Kwik AS Aluminum Straight Kit.
    - a. Description: Contains 3 pre-assembled 42 inch (1067 mm) upright and 2 horizontal rails; 1 standard railing base flange, 1 three socket tee, and 1 two socket cross.

## 2.7 CUSTOM RAILING SYSTEMS

- A. Custom Designs: Provide components and accessories including but not limited to as manufactured by Kee Safety Inc. as scheduled and indicated on Drawings, as required to match design indicated on the Drawings and as required to provide complete installation.
1. System Basis: As indicated on Drawings.
  2. System Basis: Kee Klamp.
  3. System Basis: Kee Lite.
  4. System Basis: Kee Access ADA.

## 2.8 FABRICATION

- A. Comply with design and specified requirements.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
1. Provide weep holes where water may accumulate.
  2. No welded connections.



3. Cap exposed railing ends.
- C. Upright tops shall be plugged with weather and light resistant material.
- D. Assemble components with joints tightly fitted and secured. Accurately form components to suit installation.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Prepare substrates using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- C. Coordinate post setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete and masonry construction.
  1. Coordinate delivery of anchorages to project site.
  2. Coordinate that blocking is in place for all mounting fasteners.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions including the following:
  1. Fit exposed connections accurately together to form tight joints. For all connections with Kee Klamp fittings, each set screw is to be tightened to 29 ft-lbs (39.3 N-m) of torque.
  2. Perform cutting, drilling, and fitting required for installation of handrails. Set handrails and accurately in location, alignment, and elevation, measured from established lines and levels.
  3. Set posts plumb within a tolerance of 1/8 inch (3 mm).

### 3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION