

SECTION 11014

SUSPENDED ACCESS SUPPORT EQUIPMENT AND FALL RESTRAINT EQUIPMENT PART 1: GENERAL

1.1 SUMMARY SECTION INCLUDES

- A. Suspended access support equipment including
 - 1. System design
 - 2. Tieback anchors
 - 3. Suspension line anchors
 - 4. Fall arrest anchors
 - 5. Rigging sleeves
 - 6. Davits

- B. Horizontal fall restraint cable system including
 - 1. System design
 - 2. Cable
 - 3. Intermediate anchors
 - 4. Terminating anchors
 - 5. Energy absorber

1.2 RELATED SECTIONS

- A. Section 03300 Cast-In-Place Concrete
- B. Section 05120 Structural Steel
- C. Section 05500 Metal Fabrications
- D. Section 07500 Membrane Roofing
- E. Section 07620 Sheet Metal Flashing and Trim
- F. Section 07920 Joint Sealants

1.3 REFERENCES

- A. Publications listed herein are part of this specification to extent referenced.
 - 1. American Institute of Steel Construction (AISC)
 - a. AISC Publication Load and Resistance Factor Design for Structural Steel Buildings
 - b. AISC Specifications for the Design of Cold-Formed Steel Structural Members
 - 2. American Society for Testing and Materials (ASTM)
 - a. ASTM A36 Specification for Structural Steel
 - b. ASTM A123 Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Hardware
 - c. ASTM A500 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

- d. ASTM A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- e. ASTM B209-04 Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- f. ASTM B221-02 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Wire, Shapes, and Tubes
- g. ASTM B308/B308M-02 Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
- 3. American Welding Society (AWS)
 - a. AWS D1.1 Structural Welding Code
- 4. Occupational Safety and Health Standards
 - a. ANSI/IWCA I-14.1-2001 Window Cleaning Safety
 - b. 1910 Subpart D (Walking and Working Surfaces)
 - c. 1910.66 Appendix C (Personal Fall Arrest)
 - d. 1910.66 Subpart F (Powered Platforms)
 - e. OSHA procedures and precautions for employees using descent control equipment.

1.4 SYSTEM DESCRIPTION

A. Anchorage Design Requirements

- 1. Safety anchor system design shall comply with current OSHA, ANSI, and local regulations pertaining to window cleaning and fall protection in accordance with sections 1.1, 1.2, and 1.3.
- 2. Anchor system shall provide independent fall arrest anchorages in addition to suspension line anchorages for each descent location as required by OSHA and ANSI requirements.
- 3. System shall be designed to be compatible with current window cleaning industry standard equipment (examples: rope descent systems, boatswain chairs, swing stages, transportable suspension devices).
- 4. Structural design requirements of anchorages and tie-back
 - a. Anchorage shall be capable of sustaining a minimum ultimate load of 5,000 lbs., in any direction the load may be applied, without fracture or failure.
 - b. Anchorage shall be capable of sustaining a minimum proof load of 2,500 lbs., in any direction the load may be applied, without permanent deformation or damage to anchorage.
 - c. Anchorages shall be designed with a minimum 1,250 lb. working load, in any direction the load may be applied.
 - e. Parapet or guardrails subject to direct loading by workers' ropes, possibly cables, shall be designed to withstand such loading (typically 1,800 lbs) without damage to either the structure of the rigging component in contact with it.
- 5. Locate primary support and fall arrest anchors in conjunction with areas on façade of building needing to be serviced. Consideration shall be given to the type of suspension equipment that will be used at the building and conditions such as workers' reach, rigging methods, and roof edge conditions. Anchorages shall be unobstructed and located behind and in line with equipment or portion of building they are intended to service (See illustrations on page 12: "Anchor Spacing Diagram" and "Outside Corner Layout Reference Diagram").

Note: This specification does not address powered platform design or roof mounted powered equipment; however, The ANSI/IWCA I-14.1-2001 Window Cleaning Safety

Standard states: "Rope descents shall not exceed 300 feet (91m) above grade unless the windows cannot be safely and practicably accessed by other means" (Section 5.7.12). Additionally, The ASME A120 Safety Requirements for Powered Platforms for Building Maintenance Standard should be consulted when designing such equipment.

B. Rigging Sleeve and Davit Design Requirements

1. Locate rigging sleeves and davits to accommodate suspended maintenance during swing stage operations. Typically, spacing of davits is on column lines or every 20 feet, on center. Typical spacing of rigging sleeves is 6 foot 8 inches, on center. Placement of supports should allow cables suspending powered equipment to hang either parallel and in plane or slightly angulated with the building façade as required by users. (See illustrations on page 11: "Suggested Rigging Sleeve Layout" and "Suggested Davit Layout"). Consideration should be given to operating other equipment that may be required for access.
2. Locate independent anchorages for personal fall protection when using rigging sleeves or davits in accordance with section 1.4(A) Anchorage Design Requirements (See illustrations on page 11: "Suggested Rigging Sleeve Layout" and "Suggested Davit Layout").
3. Davits shall be capable of supporting an ultimate load of not less than 4 times the rated load. The rated load of the davit shall be based on the swing stage hoist and powered platform load capacity, which is frequently 1,000 lbs or more.
4. Manufacture shall provide engineer's calculations and test report to verify that davit will support load requirements.
5. Outreach of portable davit boom shall not exceed 8 foot 6 six inches.
6. Rigging sleeves shall meet the loading requirements in Section 1.4(A) Anchorage Design Requirements.

C. Horizontal fall restraint cable system

1. The Horizontal fall restraint cable system (HFRCS) shall allow up to two users to traverse the length of the cable span, each using a single lanyard for traveling along the cable spans. Turns in the HFRCS will require a double lanyard. The HFRCS shall be designed for two users using an energy absorbing lanyard, which limits the force applied to the HFRCS to 900 lb. or less.
2. HFRCS shall spans shall not exceed 100 foot long.
3. The horizontal line shall be constructed of 3/8" x 7 x 19 stainless steel or galvanized aircraft cable, commercial grade per specification SD 118 and Fed. Spec. RR-W-410, construction grade, with an average breaking strength of not less than 14,400 lbs.
4. Horizontal lines shall be permanently attached to anchors with 2 non-corrosive permanently swaged fittings swaged to manufacturer's specifications at each termination. Swages shall be verified not to loosen under load. Load capacity of one swage shall exceed strength of wire rope.
5. Horizontal lines must be attached to anchorages designed to be capable of supporting a minimum 5,000 lb. However, the HFRCS cable and anchorages shall be independent of anchorages used for suspension in accordance with Section 1.4(A) Anchorage Design Requirements.

1.5 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product proposed

1. Test report certified by a professional engineer
2. General product data
3. Detailed drawings of equipment proposed

4. Installation instructions
- B. Shop Drawings
1. Submit scaled shop drawings showing location plan of all support equipment and sections detailing all parts and accessories.
 2. Clearly specify equipment dimensions, materials, fabrication details, hardware, and installation instructions.
 3. Include notes with guidelines of proper use of system.
 4. Equipment location plan to include identification number next to each piece of equipment, i.e. (anchors, davits, and rigging sleeves.) that are permanently affixed to a structure.
 5. Field welds shall be indicated on equipment details using AWS symbols and showing length and size. Auxiliary views shall be shown to clarify welding as required.
 6. Shop drawings shall be prepared under supervision of a registered professional engineer and shall bear engineer's seal and signature. Professional engineer shall be licensed in jurisdiction where project is located. Include P.E. certified report of tested equipment.
- C. Quality Assurance Submittal Certificates
1. Provide documentation verifying company's amount of experience and successful performance in design, fabrication, and installation of permanent window washing equipment.
 2. Submit listing of company's installations representing similar scope and complexity to project requirements for previous 10 years. List shall include information as follows:
 - a. Project name and address
 - b. Name of owner
 - c. Name of contractor
 - d. Name of architect (if applicable)
 - e. Date of completion
 3. Provide documentation verifying that installers have been trained by the manufacturer and are competent.
- D. Contract Close-out Submittals
1. Operation and Maintenance
 - a. Provide a safety inspection logbook for yearly inspections. Log book shall include a certification of compliance letter. The certification of compliance shall state that access system is in compliance with current OSHA regulations and ANSI/IWCA I-14.1-2001 Window Cleaning Safety Standard.
 2. Project Record Document Data
 - a. Record anchor locations and details.
 - b. Submit 2 copies of a reduced, plastic laminated Project Record Drawing showing as-installed anchor locations, details, and instructional text in English (and Spanish upon request). Post one copy on interior of each roof door or adjacent to exit on roof; owner shall establish exact location.
 - c. Submit a letter of certification by a registered professional engineer licensed in jurisdiction where project is located verifying that installed anchors and system are in compliance with OSHA and ANSI requirements as specified. Each piece of access equipment dedicated to the building shall be tested on site under the supervision of a P.E. in

accordance with ANSI/IWCA I-14.1-2001 Window Cleaning Safety and Summit Anchor Co. test procedures.

1.6 QUALITY ASSURANCE

A. Qualifications

1. Provide products from a company specializing in design, fabrication, and installation of permanent window washing equipment with a minimum of 5 years documented experience. Companies like miscellaneous metal fabricators not normally engaged in design and fabrications of suspended access equipment are not acceptable.
2. Manufacturer and installer shall have specific liability insurance (products and completed operations) in an amount not less than \$5,000,000.
3. Installer(s) shall be trained or qualified by manufacturer in installation techniques and procedures of permanent window washing equipment and shall demonstrate a minimum of 5 years successful experience in such installation.

B. Regulatory Requirements

1. Comply with Occupational Health and Safety Standards:
 - a. ANSI/IWCA I-14.1-2001 Window Cleaning Safety Standard
 - b. 1910 Subpart D (Walking and Working Surfaces)
 - c. 1910.66 Appendix C (Personal Fall Arrest)
 - d. 1910.66 Subpart F (Powered Platforms)
 - e. OSHA Procedures and precautions for employees using descent control equipment.
2. Welding shall comply with AWS D1.1 and shall be performed by welders qualified to work in jurisdiction where project is located.
3. Comply with AISC publications:
 - a. Load and Resistance Factor Design for Structural Steel Buildings
 - b. Specifications for the Design of Cold-Formed Steel Structural Members

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original unopened packaging.

B. Storage and Protection

1. Store materials in a protected area away from construction activities.
2. Clean bolts that have become dirty before installing.
3. Special care must be taken with stainless steel since not compatible with many chemicals and materials.
4. Do not install damaged materials. Remove damaged materials from site.

1.8 SEQUENCING AND COORDINATION

- A. General contractor is responsible for coordinating the schedule for producing shop drawings, fabricating suspended access equipment, and installation. General contractor shall allow three weeks for delivery of shop drawings and three weeks to deliver equipment upon approval of shop drawing by general contractor.
- B. Manufacturer to provide detailed installation instructions and directions for installation of embedded items, welded items, and through-bolted items, etc.

- C. Manufacturer to provide installation assistance during installation of the equipment. However, the responsibility of the installation rest with the general contractor unless equipment is installed and certified by the manufacturer.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS & INSTALLERS

- A. Suspended Access and Fall Restraint System
 - 1. Summit Anchor Company
 - Tel: 800-372-1098
 - Fax: 301-620-9819
 - Web Site: www.summitanchor.com
- B. Equivalent or superior materials and/or system substitutions shall be submitted to architect of record for review in compliance with substitution procedures in Section 01630 of this Project Manual.

2.2 STRUCTURAL COMPONENTS' MATERIALS

- A. Exposed Structural Components Finish: Galvanized Mild Steel or Stainless Steel
 - 1. Steel: ASTM A572 GR 50
 - 2. Steel: ASTM A A36
 - 3. Galvanizing: ASTM A123
 - 4. Stainless Steel; 304 ASTM A 193 Grade B8, Class 2
 - 5. Aluminum; 6061-T6 Alloy
- B. Yield Strength
 - 1. Base Plates and Bottom Plates, High Strength Steel: 50 ksi minimum
 - 2. Other Sections: 36 ksi minimum
- C. Non-Structural Components
 - 1. Aluminum; 6061-T6 Alloy
 - 2. Alloys shall conform to requirements published in AA Aluminum Standards.
 - 3. Sheet and Plate: ASTM B209
 - 4. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221
- D. Cold-Rolled Sections
 - 1. ASTM A500
 - 2. Yield Strength: 55 ksi minimum
 - 3. Tensile Strength: 62 ksi minimum
- E. Nuts, Bolts, Davit Pins, and Washers
 - 1. Stainless Steel; 304 ASTM A 193 Grade B8 or F593C
 - 2. Galvanized Flat Washers ASTM F-436 or 18 -8 Stainless Steel
- F. Anchor Bolts (for securing base plate)
 - 1. Metal: Stainless Steel, 304 Stainless Steel; ASTM A 193 Grade 8, B8
 - 2. Size: 5/8 in. diameter minimum
- G. Hilti HDA Undercut Anchoring System
 - 1. HAD-T Undercut Anchor (Through-Set Type)

2. Anchor size and embedment depth: As needed to suit loads imposed by Summit Anchor equipment. Consult project engineer to determine proper anchoring system based on concrete condition, psi, and thickness before ordering Summit equipment.
3. Installed per Hilti installation instructions.

H. Hilti HVA Capsule Adhesive Anchoring System

1. Anchor size and embedment depth: As needed to suit loads imposed by Summit Anchor equipment. Consult project engineer to determine proper anchoring system based on concrete condition, psi, and thickness before ordering Summit equipment.
2. Installed per Hilti installation instructions.
3. Installed by Hilti accredited installers only.
4. Each installed anchor assembly shall be load tested to 50 percent of its rated capacity. Test results shall be certified a P.E. with experience in suspended access equipment.

2.3 MANUFACTURED UNITS

A. Anchor

1. Capable of withstanding 5000 lbs. (2268kg) in any direction without permanent deflection.
2. Anchor eye size: Not less than ¾ inch (20 mm) diameter material with 2 ¼ in (60 mm) eye opening.
3. Anchor eye metals:
 1. Forged, 1030 quenched and tempered per ASTM 576-90-b, 72ksi minimum
 2. Stainless steel, type 304, solution annealed, 35 ksi minimum
4. Anchor tube height: not less than 4 in. above the finished roof.

B. Davit Base

1. Stanchion type complete with davit adapter and lock pin with stainless steel safety snap pin.
2. Davit socket; with two stainless steel hinge pins and stainless steel safety snap pins.
3. Pier Height: not less than 10 in. above finished roof surface to allow proper fit up with adaptor.

C. Rigging Sleeves

1. Assembled complete with cap tethered to cross bar.
2. Length as required to clear under side of façade by two inches.
3. Not less than 6" above the finished roof.

D. Cable system

1. Install complete with inline shock absorber to limit load to 2,250 lbs. or less at terminating anchors.
2. Pass through cable anchors to allow up to two workers to traverse straight cable runs with single lanyard without detachment off lanyard.

E. Flashing with one E.P.D.M. gasket seal top and base

1. Seamless Spun Aluminum Flashing: ASTM B221; Type 6061-T6 alloy
2. Stainless Steel: 304

- F. Cast in place equipment
 - 1. A minimum of two cast-in-place steel studs are required for concrete embedded anchors.

2.4 FABRICATION

- A. Fabricate work true to dimension, square, plumb, level, and free from distortion or defects detrimental to appearance and performance.
- B. Grind off surplus welding material to ensure exposed surfaces are smooth so as not to abrade workers' ropes.
- C. Welding shall be in accordance with the AWS Structural Welding Code D1.1/D1.

PART 3: EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions
 - 1. Examine areas and conditions under which permanent window washing equipment shall be installed.
 - 2. Report to general contractor any conditions that deviate from shop drawings or any defects in workmanship that would cause an unsafe installation. This report shall be verified in writing to the general contractor and any other responsible party.
 - 3. Correct conditions detrimental to timely and proper execution of work.
 - 4. Do not proceed until unsatisfactory conditions have been corrected.
 - 5. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance by installer.
 - 6. Faults occurring in work of this section due to acceptance of unsatisfactory conditions shall be corrected at no additional cost to owner.

3.2 INSTALLATION

- A. General Requirements
 - 1. Install window washing system in compliance with manufacturer's instructions. Install equipment level, tightly fitted, and flush to adjacent surfaces as needed for proper installation.
 - 2. Coordinate anchor installation with roofing installation to ensure a watertight and warrantable condition of the roofing. Anchors shall be directly flashed into roofing in a manner compatible with roofing system and anchors.
 - 3. When components come into contact with dissimilar metals, surfaces shall be kept from direct contact to prevent corrosion.
 - 4. No wall anchors shall be installed through membrane roofing system without specification detailing such from the architect or water proofing company warranting the roof.
 - 5. Deform a minimum of two threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal or vandalism. Deform threads with 2/32" stainless steel punch
- B. Instructions for welding access equipment to structure

1. All welders must be certified to American Welding Society (AWS) in accordance with AWS standards.
 2. Welding rods used to weld the anchor system to be E70 xx electrodes.
 3. Prior to welding anchors to structure, abrasively remove within one inch of all welded surfaces galvanizing, mill, scale, and rust.
 4. Immediately after welding, chip away slag to prepare for welding inspector to inspect welds.
 5. An AWS certified welding inspector must inspect and confirm size of all field welds. Following the inspection a written report must be supplied to the building owner and/or general contractor. Welded joints shall not be painted until after welding has been completed and the weld accepted.
 6. Immediately after an acceptable inspection, paint welded areas with cold-galvanizing compound to protect from corrosion.
 7. Structural steel to receive roof or wall anchors shall have a surface wide enough so that base plate can be welded all the way around. For example, anchors equipped with 4½ in. (112.5 mm) base plates would require a minimum 5 in. (137.5 mm) surface to weld to.
- C. Adhesive and Undercut Anchor Fasteners
1. Installation of Summit Anchor Co. equipment mounted with adhesive type anchor fasteners shall be performed by Hilti accredited installers only.
 2. Installation of Summit Anchor Co. equipment mounted with undercut type anchor fasteners shall be performed by Hilti trained installers only.
- D. Aluminum Flashing
1. Deck flange shall be flashed in compliance with National Roofing Contractor Association recommendations.

3.3 REPAIR/RESTORATION

- A. Galvanizing Touch-Up
1. Immediately after erection clean field welds and abraded areas. Repair damaged areas in compliance with ASTM A780.

3.4 FIELD QUALITY CONTROL

- A. Inspection and site visits
1. Inspections and site visits shall be performed while installation of equipment is in progress under the supervision qualified professional engineer registered in the jurisdiction where the project is located.
 2. On site inspection of equipment welded to structure shall be performed by an AWS Certified Welding Inspector verifying, in writing, size and quality of welds. Such an inspection shall be performed on each piece of equipment before roofing material is installed.
 3. On site inspection shall be performed on all cast in place items while being tied in with the rebar with sufficient time before concrete is poured to allow to adjustments to embedded items as recommended by inspector.
 4. G.C. shall be responsible to schedule above site visits and inspections with sufficient advanced notice given to the inspection company.
- B. Site Tests
1. All equipment shall be tested on site in accordance with manufacturer's recommendations, under the supervision of a professional engineer, and

ANSI/IWCA I-14.1-2001 Window Cleaning Safety Standards, before being placed in service.

2. Equipment shall be tested under the supervision of a professional engineer with experience with suspended maintenance equipment and manufacturers guidelines.

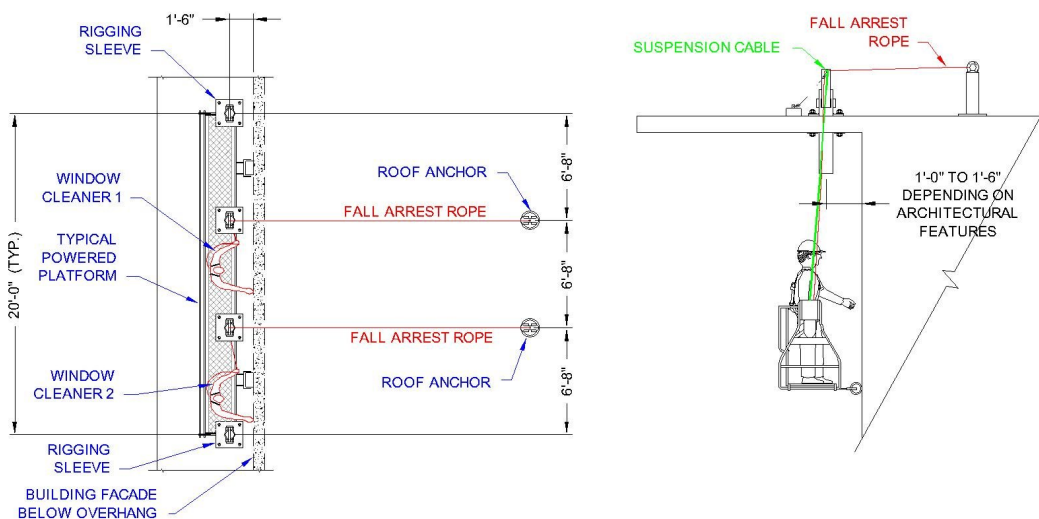
C. Manufacturer shall assist and/or supervise installation of window washing equipment installed by others when such is included in contracted.

3.5 ADJUSTING

A. Verify that completed work has been installed correctly and products function properly. Make adjustments where needed to ensure satisfactory operation.

B. Complete inspection logbook to certify system for use noting any deviations, changes, or corrections from original shop drawings. Provide as-built anchor layout plan on 11 in. x 17 in. paper or larger together with annual inspection log book.

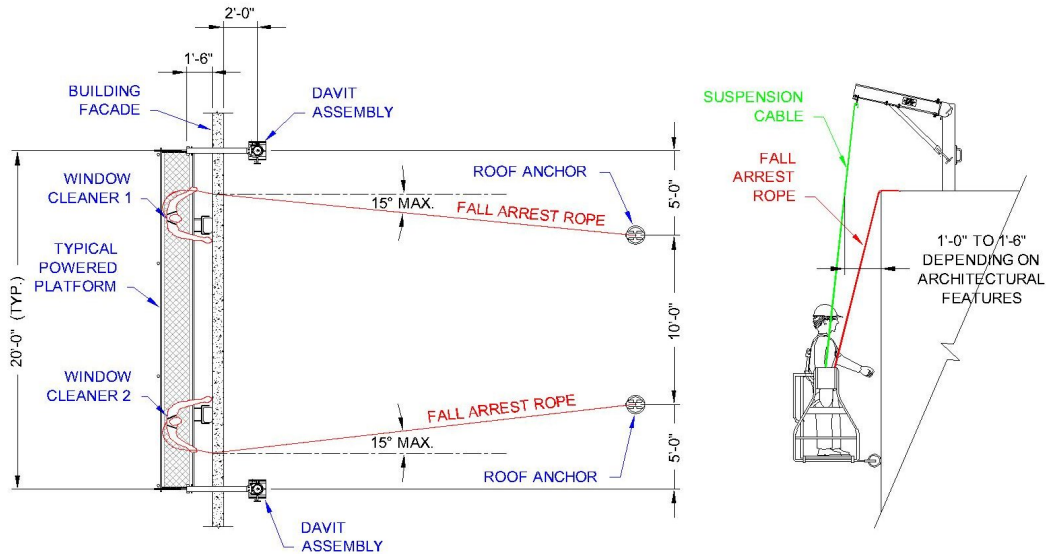
SUGGESTED RIGGING SLEEVE LAYOUT



NOTES:

1. RIGGING SLEEVE SPACING MAY VARY DEPENDING ON ROOF CONDITIONS; HOWEVER, SPACING SHOULD BE KEPT AS CONSISTENT AS POSSIBLE TO ALLOW FOR STANDARD POWERED PLATFORM LENGTH.
2. EACH WORKER MUST BE INDEPENDENTLY TIED TO AN ANCHOR ON THE ROOF.
3. PLACEMENT OF RIGGING SLEEVES AND ROOF ANCHORS SHALL ALLOW CABLES SUSPENDING POWERED PLATFORM TO HANG PARALLEL AND IN PLANE OR SLIGHTLY ANGULATED WITH THE BUILDING WHEN IN USE

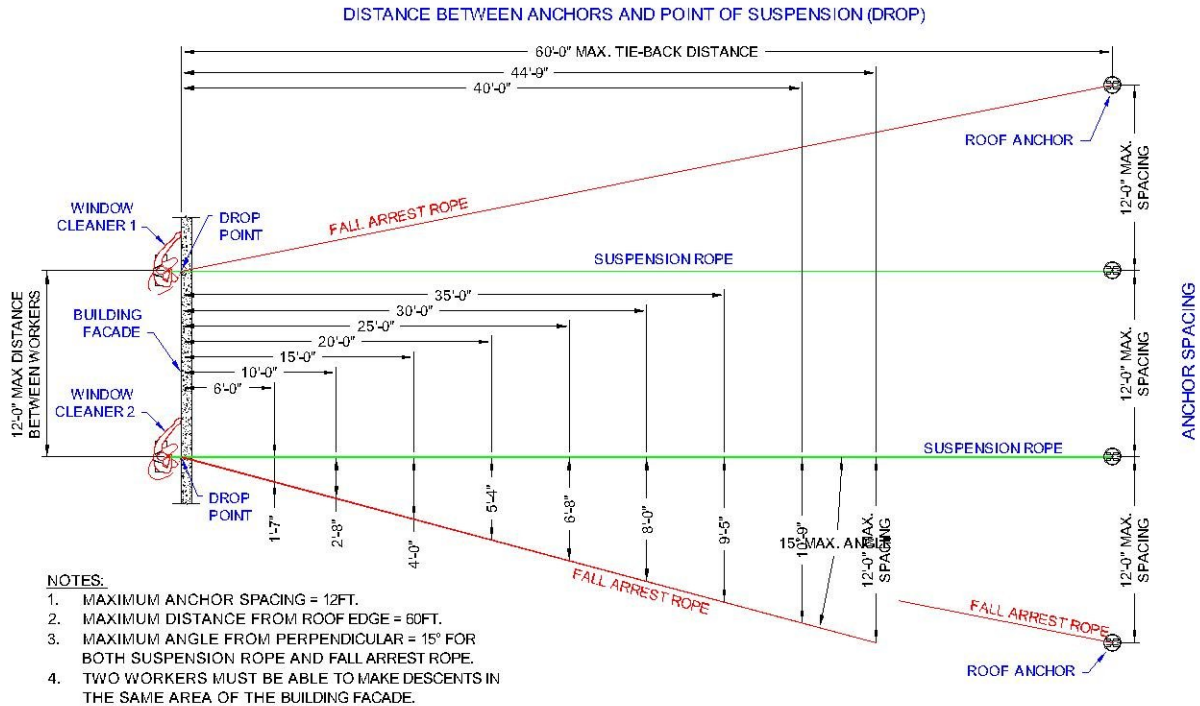
SUGGESTED DAVIT LAYOUT



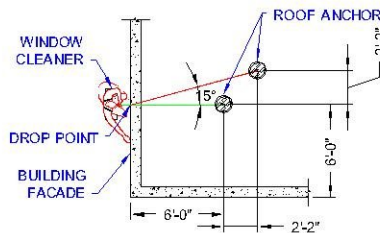
NOTES:

1. DAVIT SPACING MAY VARY DEPENDING ON ROOF CONDITIONS; HOWEVER, SPACING SHOULD BE KEPT AS CONSISTENT AS POSSIBLE TO ALLOW FOR STANDARD POWERED PLATFORM LENGTH.
2. EACH WORKER MUST BE INDEPENDENTLY TIED TO AN ANCHOR ON THE ROOF.
3. PLACEMENT OF RIGGING SLEEVES AND ROOF ANCHORS SHALL ALLOW CABLES SUSPENDING POWERED PLATFORM TO HANG PARALLEL AND IN PLANE OR SLIGHTLY ANGULATED WITH THE BUILDING WHEN IN USE AND TO ALLOW THE PLATFORM TO PRESS FIRMLY AGAINST THE BUILDING DURING ITS VERTICAL TRAVEL.

ANCHOR SPACING DIAGRAM



OUTSIDE CORNER LAYOUT REFERENCE DIAGRAM



NOTES:

1. AT OUTSIDE CORNERS, ANCHORS SHALL BE LOCATED TO PREVENT A ROPE FROM BEING DISPLACED ALONG THE ROOF EDGE.
2. WHILE SUSPENDED, WINDOW CLEANERS SHALL NOT REACH FURTHER THAN 6FT. (SEE ROPE DESCENT SYSTEMS (RDS) SECTION 5.7.10)

CAUTION:

1. THE ABOVE IS INTENDED TO SERVE AS AN ADVISORY. A QUALIFIED PERSON IS REQUIRED TO DESIGN THE ANCHOR LAYOUT SYSTEM (SEE SECTION 9.2).
2. PERIMETER GUARDING 42-INCHES IN HEIGHT (SEE SECTION 9.2.1) OR A PERSONAL FALL ARREST SYSTEM IS REQUIRED WHEN INSTALLING OR RIGGING TO AN ANCHOR WITHIN 6FT. OF A ROOF EDGE.

NOTE: LAYOUT OF DAVITS AND RIGGING SLEEVES WILL VARY DEPENDING ON BUILDING CONFIGURATION AND GEOMETRY.

END OF SECTION