







Window Cleaning Safety

IWCA I-14.1-2001



International Window Cleaning Association

WINDOW CLEANING SAFETY

IWCA I-14.1-2001

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FOREWORD

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This Standard was developed under procedures accredited as meeting the criteria for American National Standards. The consensus committee that approved the Standard was balanced to ensure that competent individuals from concerned and affected interests had an opportunity to participate in its promulgation. It was developed within the approved scope as stated in Section 1.1 of the Standard.

This Standard is available for public review on a continuing basis. This provides an opportunity for additional input from industry, academia, regulatory agencies, and the public-at-large. The use of an addenda system will allow revisions to be made in response to public review or committee actions and will be published as required.

This Standard, which is the result of extended and careful consideration of available knowledge and experience on the subject, is intended to provide minimum requirements that are recommended for use by persons in the window cleaning trade or who provide equipment or supplies to the trade, persons who employ or contract their services and for adoption and enforcement by federal, state and local authorities and by model codes.

This Standard does not recommend when and which window cleaning procedure should be used, or what additional codes and standards may have an added effect on it. For this information one should consult other pertinent standards, federal or local codes and manufacturer's information.

Neither the Standards committee nor the secretariat feel that this Standard is perfect or in its ultimate form. It is recognized that, although the window cleaning methods, procedures and materials included herein are widely used and accepted, new developments are to be expected and revisions of the Standards are necessary as the art progresses and further experience is gained. This Standard is not a successor Standard to any other Standard.

This Standard was initiated and developed by the International Window Cleaning Association when it became apparent that, as there was no other standard in place that addressed safety in the window cleaning industry, there was a need to produce one. It is recognized the affected parties of this initial Standard will require a reasonable period of time to implement the methods described herein. Due consideration shall be given toward implementation of methods described herein where the life safety of workers and public are affected. Any departure from the original design of the equipment used in this Standard that may impact the intended use of the window cleaning equipment and associated building systems should be limited solely to enhancing life safety and not for any reason that could compromise safety.

The IWCA I-14.1 Committee does not "approve," "certify," "rate," or "endorse," any item, construction, proprietary device, or activity beyond what is addressed in the Standard.

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CORRESPONDENCE WITH THE IWCA I-14.1 COMMITTEE

General. ANSI Codes and Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

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Proposing Revisions. Revisions will be made periodically to the Standard to incorporate changes when necessary or desirable, as demonstrated by the experience gained from the application of the Standard or to reflect new technology. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Proposals should be specific, citing the paragraph number(s), the proposed wording and a detailed description of the reasons for the proposal. Pertinent documentation should be included.

Interpretations. On written request, the IWCA I-14.1 Committee will render an interpretation of any requirement of the Standard. The request for interpretation should be clear and unambiguous. The following format is recommended:

Subject: Cite the applicable paragraph number(s) and provide a concise description.

Edition: Cite the edition of the Standard for which the interpretation is being requested.

Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not a request for an approval of a proprietary design or situation.

Requests which are not in the above format may be rewritten by the Committee or its Secretary prior to being answered, which may inadvertently change the intent of the original request. The Committee reserves the right to deem certain requests for interpretations not within its scope or expertise and refuse to address them.

The Committee reserves the right to reconsider any interpretation when, or if, additional information, which might affect it, becomes available to the Committee. Persons aggrieved by an interpretation may appeal it to the Committee for reinterpretation.

Attending Committee Meetings. The IWCA I-14.1 Committee holds meetings that are open to the public. Persons wishing to attend any meeting should contact the Secretary of the Committee.

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Craig S. Caulkins, P.E. -Vice Chairman
Jack Pitzer-Secretary

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1 GENERAL

1.1 Scope

This industry Standard identifies accepted safe practices for window cleaning.

1.2 Purpose

1.2.1 The purpose of this Standard is to provide safety to window cleaners and to others, such as a passerby, where window cleaning operations are in progress, by specifying equipment with practical and adequate safety factors and features, and requiring safe use, design and maintenance of such equipment.

1.2.2 Part A of this Standard has been developed for those who will use the equipment and Part B for those who design, manufacture and install the equipment. Part A and Part B of this Standard have been developed to work in conjunction with each other.

1.2.3 Furthermore the purpose of this Standard is to establish guidelines to assist window cleaning contractors, window cleaning operators, window cleaning equipment manufacturers and building owners or their operating agents to provide a safe and efficient work place for window cleaning.

1.2.4 This Standard is designed for reference by regulatory governmental agencies or to serve these agencies as a guide in the formation of safety rules and regulations and is for use by registered professional engineers and architects and by manufacturers of window cleaning equipment and devices.

1.3 Application

1.3.1 This Standard applies to all window cleaning operations performed on the inside and/or outside of any building in which the window cleaner is working from a level that is located more than 48 inches (1200 mm) above grade, or above an adjoining flat roof or other flat surface.

1.3.2 This Standard is also applicable to tools, including extension devices and such other hand held equipment as may be used in window cleaning operations.

1.4 Variations

The enforcing authority should recognize and accept newly developed techniques, methods or equipment when it has been established that they will provide equal or greater safety. Variations from the requirements of this and other applicable standards may be granted by enforcing authorities.

1.5 Design

Each system, scheme, plan and procedure for window cleaning, including the equipment used, be it permanent or portable, shall consider structural, electrical and mechanical evaluations of the effects of the loads, including fall arrest loads induced on the building's components, parapets, tie-back anchorages, etc.

1.6 Assurances

1.6.1 Window cleaning contractors shall provide to building owners and/or their operating agents the following assurances:

a) the window cleaning contractor shall meet all applicable local, state and national/federal licensing and/or registration requirements;
b) the window cleaning contractor shall strictly adhere to all applicable local, state and federal labor laws and safety codes and standards;
c) the window cleaning contractor shall utilize workers trained in accordance with Section 3.4 of this Standard;
d) where the window cleaning contractor provides transportable or personal fall protection equipment, that equipment shall be designed, maintained and inspected in accordance with this Standard.

1.6.2 Building owners and/or their operating agents shall provide window cleaning contractors with the following written assurances:

a) that the installation or structure has been inspected, tested and maintained in compliance with the requirements of this Standard;
b) that all equipment dedicated to the building meets the requirements of Part B;
c) specified load ratings, intended use and limitations for fixtures permanently dedicated to the buildings;
d) manufacturer’s instructions for installations, anchorages and fixtures permanently dedicated to the building.

1.6.3 Window cleaning contractor shall not permit employees to perform window cleaning prior to receiving assurance from the building owner that the installation meets the requirements of this Standard.

1.7 Plan of Service

A written plan developed by the window cleaning contractor or qualified person shall be provided that will inform the building owner or their operating agents when windows to be cleaned are located in areas where workers may utilize suspended equipment or; where workers are exposed to falls and other known hazards or; where the public may be exposed to overhead equipment operations. The plan shall include among its conditions the identification of hazardous areas, drop zones, safety features and areas requiring public protection.

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The plan shall be readily available for use by the building owners or their operating agent, window cleaners, enforcing authorities and emergency personnel. The use of a written plan applies to a dwelling house over 3 full stories high or occupied by more than 3 families.

1.8 Emergency Recovery

In the event of power failure, equipment failure or disability of any nature, means and procedures shall be established and provided for the safe emergency recovery of persons working from suspended equipment or other types of installations. Emergency procedures shall be included into the work plan in accordance with Section 1.7, as well as in the operating instructions for the installation.

2 DEFINITIONS

accept, accepted, acceptable- a practice, design or method recognized by the industry or the authority having jurisdiction.
access platform- a platform used to gain access to an area of the building.
anchorage- a secure point of attachment. Refer to section 3.9.
angulated roping- a suspension method where the upper point of suspension is closer to the building than the attachments on the suspended unit causing the suspended unit to bear against the face of the building.
approved- accepted as satisfactory by a duly constituted administrative or regulatory authority.
bearing point- is a location on the surface of a building where the suspension line contacts the building.
boatswain's chair- a seat for one person, suspended by a single line or tackle, which is designed to be raised and lowered by the user or his/her assistant.
body harness- a design of simple or compound straps that may be secured about the wearer in such a manner as to distribute the stopping forces over the thighs, buttocks, chest and shoulders, or any combination thereof, and with provisions for attaching a lanyard.
cable- a conductor or groups of conductors enclosed in a weather proof sheath, that may be used to supply electrical power and/or control current for equipment or to provide voice communication circuits.
certified- accepted by design, evaluation or inspection by a registered professional engineer or legal jurisdiction.
competent person- a person who by way of training or expertise is knowledgeable of applicable standards, is capable of identifying workplace hazardous or dangerous conditions relating to the specific operation, is designated by the employer and has the authority to take appropriate actions.
controlled descent apparatus/controlled descent equipment- see RDS.
davit- a device used for suspending a platform or seat board from work, storage or rigging locations on the building being serviced. Unlike an outrigger, a davit reacts its operating load into a single roof socket or carriage attachment.
drop- a vertical area or work zone accessed by the worker or piece of equipment during one descent.
drop line- a vertical line from a fixed anchorage, independent of the work surface, to which the lanyard is affixed.
fall hazard- greater than 48 inches (1200 mm).
fixture- attachments, anchors, anchorages, tie backs or support equipment permanently dedicated to a given site.
grade- the ground, the floor, the sidewalk or any other approximately level, solid surface of sufficient area and having sufficient structural strength to be considered a safe work place.
guy- (standing rope) a supporting rope which maintains a constant distance between the points of attachment to the two components connected to the rope.
horizontal lifeline- a means of providing a certified anchorage for a personal fall arrest system, designed by a registered professional engineer.
in line- perpendicular with an area being accessed; a straight path between anchorage and suspended worker or between tieback anchorage and suspension device; parallel position of equipment or lifeline to work-face.
inside, from the- all of the window cleaner's body except one arm shall be on the interior side of the plane of the window frame.
installation- all equipment and all effected parts of a building which are associated with the performance of building maintenance.
lanyard- a flexible line to secure a wearer of a safety belt or harness to a drop line, lifeline or fixed anchorage.
level- a flat horizontal working surface.
lifeline- see drop line.
mobile scaffold, manual- a scaffold assembly supported by casters and moved manually.
outside, from the- more than a single arm of the cleaner's body is outside of the plane of the window frame
perpendicular- at a right angle to parapet or in line with an area being accessed.
platform- a working surface fabricated for persons that is capable of being elevated.
plumb line- is the shortest imaginary line that is formed from an elevated point to level ground.
portable equipment- equipment that is manually relocated from work position to work position on a given building.
power platform- a manned platform which is suspended by wire rope and operates by power to access areas of a building in the up or down direction for the purpose of building maintenance.
primary support/suspension- a working line or approved anchorage used for attachment of a working line.
professional engineer- one who has professional experience in the practice of design and installation of permanent window cleaning equipment, window cleaning devices, glass curtain wall and temporary scaffold rigging devices. Engineer must be familiar with all pertinent codes and standards and hold a valid license issued by the state in which he practices.

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qualified person- a person who, by possession of a recognized degree or certificate of professional standing or who, by extensive knowledge, training and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.
RDS (Rope Descent Systems)- an assembly of components that when properly configured will provide means to descend a drop in a manner whereby the acceleration forces of gravity are controlled, permitting the operator to slow or halt his/her descent on a synthetic fiber rope at any desired moment (aka, CDE, CDA).
rated load- the combined weight of men, tools, equipment and other materials which the device is designed and installed to lift and support.
safety line anchor- see anchorage.
sit harness- a design of simple or compound straps that may be secured about the wearer in such a manner as to distribute the stopping forces over the thighs, buttocks or any combination thereof, and with provisions for attaching a lanyard in the front waist.
shall- indicates the rule is mandatory and must be followed.
should- indicates a recommendation, the advisability of which depends on the facts in each situation.
sill- a component or group of components of the building or structure's exterior or interior, immediately below the window and of sufficient width and design to safely support a window cleaner while positioned by a window cleaner's belt.
slack- without tension or applied load.
standing line- a means to wind stabilize a work platform utilizing vertical lines strung between a fixture at the roof level and a ground anchorage.
static kernmantle- synthetic rope constructed of continuous filament strands woven into a dense cover over a unidirectional filament core and maintains low elongation (aka, static fiber rope, static rope).
swinging scaffold, manual- a platform suspended by two or more lines, designed to be raised and lowered by users and is independent of the building, except for attachment at the roof, parapet or other supporting fixture.
tie-back anchor- see anchorage.
transportable equipment- equipment that is relocated from property to property.
window cleaner- a person who by occupation and training is proficient in window cleaning.
window cleaner's belt anchor- specially designed fall preventing attachment points, permanently affixed to a window frame or to a building part, immediately adjacent to the window frame, for direct attachment of the terminal portion of a window cleaner's belt.
window cleaning- the operation of cleaning or restoring windows, wiping, or other methods of cleaning windows, window frame or curtain wall sections, spandrel panels, etc.
working line- a rope which is suspended vertically from an anchorage and is used for accessing parts of a building to provide maintenance (aka, drop line, main line).
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PART A- GENERAL AND PERFORMANCE REQUIREMENTS

3 GENERAL REQUIREMENTS FOR ALL WINDOW CLEANING OPERATIONS AND APPARATUS

3.1 Age

Employers of persons engaged in window cleaning shall observe all provisions of minimum-age laws for persons engaged in hazardous occupations.

3.2 Equipment Design Requirements

All equipment shall be engineered, designed and approved by the manufacturer for use in window cleaning conforming with the requirements of Part B of this Standard. Alterations to the characteristics of a unit's design or capacity to safely support the equipment and its operators shall be prohibited unless specifically approved in writing by its original manufacturer or a registered professional engineer.

3.3 Safety Equipment

Employers shall provide their window cleaning employees with safety equipment and devices conforming with the requirements of this Standard and shall maintain such equipment in safe operating condition at all times. Employers shall also train employees as to how to inspect each piece of equipment provided. Any person, employer or employee exposed to a hazard or using any suspended equipment shall use this safety equipment.

3.4 Training, Instruction and Supervision

3.4.1 Employers and employees shall be proficient in safe working procedures and proper use of equipment. Employers shall be qualified in the instruction and supervision of safe and proper working procedures and practices. Enforcing authorities may require evidence that workers are proficient and capable of safely carrying out their tasks.

3.4.2 Satisfactory completion of a course in safe practices and a proper on-the-job training period would qualify a window cleaner as having met the requirements of Section 3.4.1. The employer may delegate the training and supervision to a qualified person.

3.4.3 Manufacturer's instructions shall be provided to the users for all equipment utilized in the performance of their tasks.

3.4.4 For guidelines of the requirements of a training course, consult Appendix B of this Standard.

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3.5 Chemicals

When chemicals are used for window cleaning it shall be the employers' responsibility to establish a written hazard communication program complying with OSHA 29 CFR 1910.1200, and to adequately train and provide all information to employees that will be working with the chemicals. Training shall also comply with Section 3.4 of this Standard. Hazardous or corrosive materials shall not be used in the course of window cleaning when they may endanger the health and safety of the worker or may affect the safe operation of the equipment.

3.5.1 When hazardous or corrosive materials will be utilized in the course of window cleaning, the employer will consult with qualified persons regarding the chemical agent's compatability with the window cleaning apparatus and safety systems. To determine compatability, laboratory testing may be required.

3.5.2 Employees that will be subjected to working with hazardous or corrosive chemicals shall use personal protective equipment in accordance with the chemical's "Material Safety Data Sheet" (MSDS) and in compliance with OSHA 29 CFR 1910.134 through 1910.136.

3.5.3 The use of hazardous or corrosive materials shall be incorporated into the work plan in accordance with Section 1.7 of this Standard.

3.6 Working Surfaces

No window cleaner shall be permitted to work from, stand or walk on any surface, including skylight, sloping and horizontal glass, that is not designed for such loading.

3.7 Excessive Wind Speed

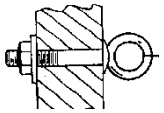
Window cleaning shall be prohibited when the window cleaner's work area is exposed to excessive winds. Excessive winds are considered to be any wind which constitutes a hazard to the worker, public or property**.**

3.8 Fall Protection

Fall protection, perimeter guarding, personal fall arrest systems or a personal fall restraint system (as applicable) shall be provided for all work areas (with the exception of working from a ladder supported at grade or using a window cleaner’s belt and window cleaner’s belt anchors) that expose a worker to a fall hazard when approaching within 6 feet (1800 mm) of an unguarded edge or unguarded skylight. The means or methods used shall comply with the requirements found in Section 9.2 of this Standard.

3.9 Anchorages

Fig. A-1-Cutaway Anchor



Building owners and window cleaning contractors shall not allow suspended work to be performed unless it has been determined that the building has provided, identified and certified anchorages complying with Section 9 or 10 for: independent safety lines; tie-backs for outriggers, parapet clamps and cornice hooks; primary support anchorages for powered and manual boatswain's chairs; primary support anchorages for rope descent systems; horizontal (rope) lines or lifelines; and wherever else required.

3.10 Protection For The General Public

When equipment used to access windows is suspended over or erected near an area traversed by workers, the public or vehicular traffic, warning signs shall be positioned below and the ground area directly under or adjacent to the work zone shall be effectively blocked by means of barricades. A competent person shall determine if additional means of protection are necessary. When there may be a danger to the public, all window cleaning tools or other items shall be secured to the worker, seatboard or platform to prevent them from falling.

3.11 Warning Labels

Manufacturers of all equipment supplied for work performed within this Standard shall provide warning labels and instructions alerting users of any hazards and the precautionary measures necessary for the safe operation and use of said equipment. Warning labels shall be legible. This section only applies to materials which are components of access equipment or a fall protection system.

3.12 Working Around Electrical Hazards

Unprotected, energized electrical lines or equipment shall not be contacted with tools or equipment. A minimum safe distance is no less than 10 feet (3 m). If unsure, the power company should be consulted.

4 Building Requirements

4.1 Applicability

4.1.1 All buildings where window cleaning is performed that employ suspended equipment shall be equipped with roof anchorages or other approved devices which will provide for the safe use of the equipment in conformance with the provisions of this Standard.

4.1.2 Where the window cleaning is performed that employ methods other than those complying with 4.1.1, they shall have or utilize approved devices that will provide for safe

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working procedures in conformance with the provisions of this Standard.

4.1.3 Sections 4.1.1 and 4.1.2 apply to a dwelling house over 3 full stories high or occupied by more than 3 families.

4.2 Means and Methods

4.2.1 Buildings erected or substantially remodeled in areas where window cleaning may be affected after the adoption of this Standard shall be equipped with the appropriate means and methods necessary to comply with the provisions of this Standard.

4.2.2 Existing buildings without the means and methods to safely clean its windows shall be provided with such a system and/or employ methods complying with the provisions of this Standard.

4.2.3 Transportable equipment used to access a building's interior or exterior façade shall be designed and used in accordance with the requirements of this Standard.

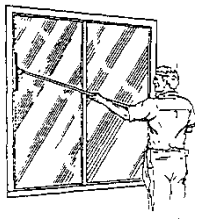
4.2.4 Buildings with an existing window cleaning system shall provide and maintain the means and methods to access its facade in accordance with the Standards in force at the time of the building's original construction and shall provide fall protection for window cleaners complying with Section 9.2 of this Standard.

4.2.5 Buildings with a permanent installation system shall not have the system diminished unless it has decayed beyond its ability to be renovated. In such cases an equivalent or alternate system approved by a registered professional engineer experienced in such design shall be installed in strict accordance with the applicable sections of part B of this Standard.

5 Performance Requirements

5.1 Extension Devices

Fig. A-2 Extension Device



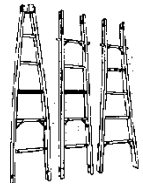
5.1.2 Employees shall be trained in the use and care of extension poles and water fed poles before they shall be permitted to use such equipment. Training shall include but not be limited to proper inspection, assembly, erection and a full understanding of safe working conditions considering as a minimum, exposure to electrical sources and wind.

5.1.3 Extension poles and water fed poles shall not be used when any part of them may be closer than 10 feet (3 m) to an unshielded electrical supply or device and in compliance with Section 3.12 of this Standard.

5.1.4 When an extension pole or device is used while working on or from ladders, platforms or suspended access equipment near areas traversed by the general public, tools, attachments and the pole itself shall be secured to prevent them from falling.

5.2 Ladders

Fig. A-3 Section Ladder



5.2.1 Consideration should be given to other access methods before ladders are used for window cleaning.

5.2.2 When ladders are used for window cleaning applications, their design, use and maintenance shall conform to the provisions of Section 10.1 of this Standard for ladders and in accordance with its manufacturer's instructions.

5.2.3 Employees shall be trained in the use and care of ladders before they may be permitted to use such equipment. Training shall include but not be limited to understanding the manufacturer's instructions, inspection, correct selection of a ladder, proper assembly and disassembly, carrying, moving, climbing, descending and a full understanding of safe working conditions considering as a minimum, fatigue, slippery/wet surfaces and wind.

5.2.4 When used, ladders shall be inspected daily. Those with defects which may affect their safe use shall be immediately removed from service, tagged or marked with a label which states, "Dangerous, Do Not Use", then restored or destroyed. Improvised repairs are prohibited.

5.2.5 Ladders shall be stored in such a manner as to provide ease of access or inspection and to prevent danger of accident when withdrawing a ladder for use. Ladders when not in use shall be stored at a location where they will not be exposed to harmful elements and where there is proper ventilation.
(a) Ladders stored on or transported on exposed vehicle racks shall be properly secured to prevent damage and care shall be taken to ensure that prolonged exposure is not harmful.
(b) Wood ladders shall not be stored near radiators, stoves, steam pipes, outside or other places subject to excessive heat or dampness. Rungs shall be kept free of grease or oil. Wood ladders shall not be painted with other than a transparent material.

5.2.6 Ladders supported at grade shall not be used to clean a window whose top is more than 45 feet (13.7 m) above the floor, adjoining ground or flat roof. Ladders used to clean windows whose top is more than 35 feet (10.7 m) above the floor or adjoining ground or flat roof shall be equipped with stand-offs or equivalent means to stabilize the ladder. Each end of the stand-off shall be securely and squarely rested

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against a vertical surface. The top rest for the ladder (with or without stand-offs) shall be rigid and shall have ample strength to support the applied load. Ladders shall not be placed or obstructed in a manner that may make the method of using the ladder unsafe.

5.2.7 Prior to using a ladder, the areas to be serviced shall be visually inspected and where necessary, appropriate measures shall be taken to ensure that building features, such as window ledges, frames, entranceways and landscaping will not impair the safe climbing, descending and moving of a ladder. These measures shall be incorporated into the work plan in accordance with Section 1.7 of this Standard.

5.2.8 When using ladders the worker shall wear adequate footwear.

5.2.9 At all times when a cleaner is working on a ladder over 37 feet (11.3 m) long, an additional person shall stand at the foot of the ladder, face it and hold it with both hands. Ladders shall not be used in windy conditions in accordance with Section 3.7 of this Standard.

Fig. A-4 Extension Ladder



5.2.10 All ladders shall be used at such a pitch that the horizontal distance from its top support point to the foot of the ladder is ¼ of the unsupported length of the ladder (i.e.; the length along the ladder between its foot and upper support).

5.2.11 No ladder shall be used to gain access to a roof unless the top of the ladder extends at least 36 inches (.9 m) above the point of support at eaves, gutter or roof line.

5.2.12 All ladders shall be equipped with non-slip bases suitable for the bearing surface. Middle and top sections shall not be used as bottom sections unless the user equips them with non-slip bases. Non-slip bases are not intended as a substitute for care in safely placing, lashing or holding a ladder that is being used on oily, metal, concrete or slippery surfaces.

5.2.13 Ladders shall not be placed on boxes, barrels or other unstable bases to obtain additional height.

5.2.14 Ladders shall not be placed on uneven surfaces unless equipped with an engineered leveling system.

5.2.15 Portable rung ladders with reinforced rails shall be used only with the metal reinforcement on the under side.

5.2.16 Metal ladders shall be used in accordance with section 3.12 of this Standard.

5.2.17 Ladders shall not be used simultaneously by more than one person nor with ladder jacks and scaffold planks unless the ladders are engineered (designed) for such use and personal fall protection is provided.

5.2.18 Ladders shall not be placed in front of doors unless the door is blocked open, locked or guarded.

5.2.19 When ascending or descending the ladder, the user shall face the ladder. When working on the ladder, the user shall face the ladder and the center of their torso shall not extend past either side rail of the ladder. Over-reaching is strictly prohibited.

5.2.20 Ladders shall not be used as guys, braces or skids, or for any other purpose other than than those orginially intended.

5.2.21 Cross-bracing on the rear section of stepladders shall not be used for climbing unless the ladder is designed for and provided with steps for climbing on both front and rear sections.

5.2.22 Prior to assembly, extension and working from a ladder, proper danger signs and barricades shall be in place in accordance with Section 3.10 of this Standard.

5.2.23 When using ladders on roof levels, setbacks, ledges or elevated working surfaces, the work position of the ladder shall be a minimum distance (measured from any edge of the work area) equaling the working length of the ladder plus three feet.

5.2.24 While working from a ladder, the worker shall not stand above the 3rd rung from the top of the ladder and shall keep the center of their torso between the side rails of the ladder. The uppermost resting point (fulcrum) of the ladder must not be below the second rung from the top of the ladder at any time when a person is working on the ladder.

5.2.25 No device may be used to gain additional reach from a ladder that would hinder the worker from compliance with Section 5.2.24. The use of a ladder with a hook attached to it to hang on or over a parapet wall shall conform to Section 3.2 of this Standard.

5.2.26 The ladder shall be tied back and the worker shall be secured to an independent anchorage in conformance with Section 9 of this Standard. A hook ladder shall have a minimum standoff slope of 12 inches (.3 m) per 10 feet (3 m) and its overall length shall not exceed 20 feet (6 m). The use of a hook ladder is an exception to Section 3.8 thus workers using or placing the ladder shall use a Personal Fall Arrest System in conformance with Section 9.2.2.

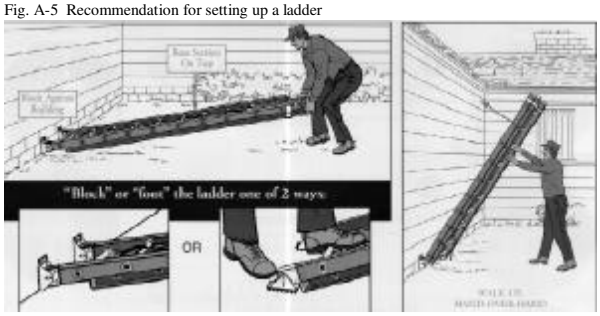
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5.2.27 Recommendations for safe set up and assembly

Extension Ladders

(a) The ladder should be laid on the ground at the point on the building where it will be erected. Make sure that the base section of the ladder is up and the extension fly is on the ground.

Fig. A-5 Recommendation for setting up a ladder



(b) Block the ladder using the building or a co-worker standing with one foot on the bottom rung and one foot against the foot of the ladder.

(c) Lift up the top section of the ladder to your highest point of reach using both hands.

(d) Working hand over hand, push the ladder toward the building until it is raised to a point where it can be rested against the building.

(e) Extend the ladder using the pre-attached rope and pulley system making sure the ladder locks correctly into place before climbing. Extreme care should be taken to avoid damaging the building or surface while raising or lowering the ladder. To disassemble the ladder, perform the above procedure in reverse.

5.2.28 Sectional Ladders

(a) Set the sections of ladders upright against the building or wall to be serviced with the base section closest to the surface and the center sections following it, with the top section as the outermost piece.

(b) Lift up the top section by grabbing close to the bottom and setting it on the top of the next section.

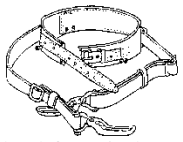
(c) Lift up on the lower portion of these assembled sections and setting each of them on the top of the next section.

(d) When disassembling sectional ladders, perform the above procedure in reverse.

(e) The worker shall not assemble sectional ladders higher than recommended by the ladder manufacturer.

5.3 Window Cleaner's Belts

Fig. A-6 Window Cleaner's Belt



5.3.1 When such equipment is used for window cleaning applications, its design, use and maintenance shall conform to the provisions of Section 10.2 of this Standard for window cleaner's belts and in accordance with the manufacturer's instructions.

5.3.2 Employees shall be trained in the use and care of window cleaner's belts before they are allowed to use such equipment. Training shall include but not be limited to understanding the manufacturer's instructions, inspection, wearing the proper size, storing, correct use of anchors and terminals and a full understanding of safe working conditions considering as a minimum, obstructions, slippery/wet surfaces and wind.

5.3.3 Each window cleaner's belt shall be inspected daily. Those that have defects which may affect their safe use shall be immediately removed from service, tagged or marked with a label which states, "Dangerous, Do Not Use", then restored or destroyed. Improvised repairs are prohibited.

5.3.4 Window cleaner's belts shall be stored in such a manner as to provide ease of access or inspection, and to prevent exposure to moisture, sunlight or corrosion

5.3.5 Prior to using a window cleaner's belt, the areas to be serviced shall be visually inspected and where necessary, appropriate measures shall be taken to ensure that building features, such as windows, window ledges and frames are functionable and will not impair the safe use of a window cleaner's belt. These measures shall be incorporated into the work plan in accordance with Section 1.7 of this Standard.

5.3.6 It is prohibited to use any anchor that appears to be damaged, deteriorated, worn, loose, insecure or which prohibits the easy engagement of the belt terminal over the anchor head. The use of eyebolts, mortar hooks and lag screws is prohibited.

5.3.7 Cleaning from the inside shall be done without extending more than one arm beyond the window sash.

5.3.8 When cleaning from the outside with the use of a window cleaner's belt, the worker shall attach one belt terminal to an anchor without extending more than one arm beyond the window sash. The worker shall then apply a firm pull on the anchor via the belt runner, observing the anchor assembly for any unsafe condition as outlined in 5.3.6 above. The worker shall attach the other belt terminal to the second anchor before or immediately upon climbing out. If there are no unsafe conditions, the worker may then continue with the window cleaning.

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5.3.9 Both terminals shall remain attached to anchors during the cleaning operation.

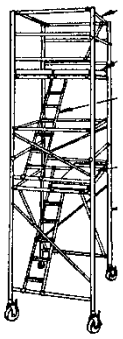
5.3.10 When entering the window from the outside, one terminal shall remain attached to an anchor until the worker has returned inside.

5.3.11 Traveling on the outside of the building shall not be permitted where the sill or ledge is less than 6 feet (1800 mm) wide unless it is possible to keep at least one window cleaner's belt terminal attached at all times.
(a) The distance between anchors shall not exceed 48 inches (1200 mm) horizontally unless the sill or ledge is at least 12 inches (305 mm) wide and the slope is less than 5 degrees in which case the distance between anchors may be as much as 6 feet (1200 mm). However, this method of traveling shall not be permitted if the sill or ledge is not continuous with at least 6 inches (152 mm) in front of the mullions or if each window unit is not readily accessible.

5.3.12 When performing beltwork over public areas, barricades and danger signs shall be used in accordance with Section 3.10 of this Standard. If there is a danger to the public, all window cleaning tools shall be secured to the worker in order to prevent them from falling.

5.4 Manually Propelled Mobile Scaffolds

Fig. A-7 Tower Scaffold



5.4.1 When such equipment is used for window cleaning applications, its design, use and maintenance shall conform to the provisions of Section 11 of this Standard for manually propelled mobile scaffolds and in accordance with the manufacturer's instructions.

5.4.2 Employees shall be trained in the use and care of manually propelled mobile scaffolds before they are permitted to use such equipment. Training shall include but not be limited to understanding the manufacturer's instructions, inspection, scaffold assembly and dismantling, moving, climbing, descending, fall protection and a full understanding of safe working conditions considering as a minimum, unlevel surfaces and wind.

5.4.3 Prior to erecting, inspect the scaffold's general condition and all safety devices including guard rails, toe boards, access ladder, brackets, putlogs, tubes and couplers and tightened nuts & bolts. Those components which have defects that may affect their safe use shall be immediately removed from service, tagged or marked with a label which states, “Dangerous, Do Not Use”, then restored or destroyed. Improvised repairs are prohibited.

5.4.4 Scaffolding and its components shall be stored in such a manner as to provide ease of access or inspection and to prevent danger of an accident when withdrawing the scaffolding for use. Components should be stored at a location where they will be protected from the elements. Climbing and work surfaces shall be kept free from grease, oil or other slippery substances.

5.4.5 Manually propelled mobile scaffolds may be used for window cleaning operations only when they can be erected from a suitable, stable base or footing, remain plumb and square during use, and be moved over level surfaces free from obstructions or openings to the point of use.

5.4.6 Prior to using a manually propelled mobile scaffold, the areas to be serviced shall be visually inspected and where necessary, appropriate measures shall be taken to ensure that building features such as window ledges, frames, awnings, cornices, sidewalks, stairways and landscaping will not impair the safe erection, climbing, descending and moving of a mobile scaffold. These measures shall be incorporated into the work plan in accordance with Section 1.7 of this Standard.

5.4.7 Locking scaffold planks shall be used to prevent dislodging while moving the scaffold tower.

5.4.8 Workers shall use such scaffolds in accordance with Section 3.12 of this Standard.

5.4.9 Workers shall examine the work area and identify floor openings and other hazards with appropriate signage and/or barricades.

5.4.10 If the work area is over steps or an unleveled area, adjustable legs must be used to level base to build upon. Do not use mobile scaffolds on sloped surfaces unless its frame is elevated as to raise its wheels from the surface. No more than 12 inches (305 mm) of a screw jack shall extend between the bottom of the adjusting nut and the top of the caster.

5.4.11 Wheels must be locked before assembling above the first section, ascending, descending and disassembling the scaffold.

5.4.12 Free standing scaffold towers whose vertical dimension exceeds four (4) times their minimum base dimension must be restrained from tipping using an industry acceptable method such as tie-ins or outriggers.

5.4.13 Scaffolding shall not be moved when it is occupied.

5.4.14 Before moving an un-occupied tower, the work location should be surveyed for any hazards (including unstable ground or exposed power lines) and all equipment on the tower should be secured.

5.4.15 Prior to assembling, moving and disassembly, proper danger signs and barricades shall be in place in accordance

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with Section 3.10 of this Standard. Where it may be a danger to the public, window cleaning tools shall be secured to the worker in order to prevent them from falling.

5.4.16 Assembly and Disassembly

(a) Workers are prohibited from attempting to assemble a scaffold by themselves unless the scaffold is of a pre-assembled design that allows for one person set up and take down.

(b) A competent person shall determine when fall protection is to be used during the assembly and disassembly of a scaffold.

(c) Rope shall be used to raise and lower structural components of the scaffolding. At no time are workers permitted to climb the scaffold while carrying a structural component.

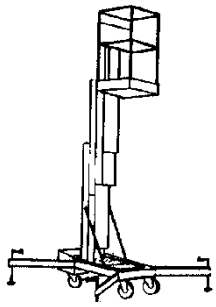
(d) Never remove a component without considering its affect on the entire scaffold structure.

(e) Remove equipment and clean debris from components prior to dismantling scaffold.

(f) Lower dismantled components in a safe manner to protect those below and prevent damage to the components.

5.5 Aerial Work Platforms (Vehicle Mounted and Manually Propelled)

Fig. A-8 Manlift



5.5.1 When such equipment is used for window cleaning applications, its design, use and maintenance shall conform to the provisions of Section 11 of this Standard for aerial work platforms and in accordance with the manufacturer's instructions.

5.5.2 Employees shall be trained in the use and care of an aerial work platform before they shall be permitted to use such equipment. Training shall include but not be limited to understanding the manufacturer's instructions, inspection, site assesment, proper operational procedures, basic electrical understanding, fall protection and a full understanding of safe working conditions considering as a minimum, unlevel surfaces and wind. In the event the aerial lift is rented, it shall be the responsibility of the rental company to familiarize the operators with its use.

5.5.3 The aerial work platform shall be inspected by a competent person before each use. All wire ropes, chains and bolts must be secure. All electrical and manual functions shall be working. Smoking shall be prohibited when operating a gas powered lift. Any damage or excessive wear shall be reported immediately. The lift is not to be used if any components do not function properly. Modifications to the aerial platform are strictly prohibited unless performed by the manufacturer.

5.5.4 The unit shall be stored in such a manner as to provide ease of access or inspection, and to prevent danger of accident when withdrawing it for use. Working surfaces shall be kept free from grease, oil or other slippery substances.

5.5.5 Prior to using the aerial work platform, the areas to be serviced shall be visually inspected and where necessary, appropriate measures shall be taken to ensure that building features, landscaping or working surfaces are free from obstructions that may impair the safe operation of the aerial platform. These measures shall be incorporated into the work plan in accordance with Section 1.7 of this Standard.

5.5.6 Aerial work platforms may be used for window cleaning operations only when they can be readily and safely moved into positions where all tires and outriggers (as applicable) can be properly seated on a suitable stable base or footing and retain that position during the entire work cycle.

5.5.7 Aerial work platforms shall be operated in accordance with Section 3.12 of this Standard.

5.5.8 The rated load for the aerial work platform shall not be exceeded.

5.5.9 Aerial work platforms requiring outriggers shall have their outriggers fully extended in all directions and firmly seated on the work surface prior to operating the unit. The platform shall not be mounted on a truck or any unstable surface in order to gain more height unless the platform is a manufactured truck mounted unit.

5.5.10 Workers shall examine the work area and identify floor openings and other hazards with appropriate signage and/or barricades.

5.5.11 The aerial work platform must be leveled before using.

5.5.12 All occupants shall use personal fall restraint equipment in accordance with the manufacturer’s instructions.

5.5.13 Makeshift devices or ladders used to gain more height out of the basket are prohibited.

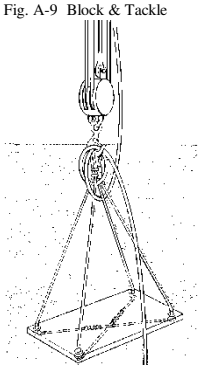
5.5.14 Unless specifically designed for transportation under load, the aerial work platform shall not be moved while occupied; and if moved, the surface it is moved on should be level, stable and continuous.

5.5.15 Aerial work platforms operated outside have specific wind limitations. The use of a platform outside shall be discontinued in accordance with Section 3.7.

5.5.16 Prior to setting up, working from and removing the aerial platform from a work location, proper danger signs and barricades shall be used in accordance with section 3.10. Where it may be a danger to the public, window cleaning tools shall be secured to the worker in order to prevent them from falling.

5.6 Manual Swinging Scaffolds and Boatswain's Chairs

Fig. A-9 Block & Tackle



5.6.1 When such equipment is used for window cleaning applications, its design, use and maintenance shall conform to the provisions of Section 13 of this Standard for manual swinging scaffolds and boatswain's chairs and in accordance with the manufacturer's instructions.

5.6.2 Employees shall be trained in the use and care of manual swinging scaffolds and boatswain's chairs before they are permitted to use such equipment. Training shall include but not be limited to understanding the manufacturer's instructions, inspection, scaffold assembly and dismantling, accepted rigging practices, moving, hoisting for ascent and descent, fall arrest requirements and a full understanding of safe working conditions considering as a minimum, correct rigging and the effects of wind on suspended operations.

5.6.3 Prior to assembling, inspect the scaffold/boatswain's chair for their general condition and all safety devices including: decking, chair, guard rails, stirrups/hangers, toe boards, brackets, wire ropes, tightened nuts & bolts, ropes and blocks. Those components which have defects shall be immediately removed from service, tagged or marked with a label which states, "Dangerous, Do Not Use", then restored or destroyed. Improvised repairs are prohibited.

5.6.4 Scaffolding/Boatswain's chairs and their components shall be stored in such a manner as to provide ease of access or inspection and to prevent danger of accident when withdrawing the equipment for use. Components shall be stored at a location where they will be protected from the elements. Working surfaces shall be kept free from grease, oil or other slippery substances. Ropes shall be stored in a cool, dry, dark environment.

5.6.5 Manual swinging scaffolds and boatswain's chairs may be used for window cleaning operations only where windows cannot be accessed safely and practicably by other means and where the height of suspension does not exceed 75 feet (23 m) above grade or a building set back unless the use of tackle with an automatic brake is employed.

5.6.6 Automatic braking systems, manual swinging scaffolds and boatswain's chairs may be used for suspension heights not exceeding 130 feet (40 m) when the tackle has been designed so that a minimal amount of force is required in raising or lowering the worker. The unit shall automatically maintain an elevation when the force to raise or lower the unit is not applied. There shall be no creep. Tackle components shall have a minimum rated strength of 5,000 pounds (2268 kg). Tying of knots, half hitches, bends, etc. shall not be allowed in any block and tackle suspension device to maintain an elevation.

5.6.7 Operators of manual swinging scaffolds and/or boatswain's chairs shall be equipped with and utilize an independent fall arrest system complying with Section 3.8 and Section 9.2.2.

5.6.8 Prior to using a manual scaffold or boatswain's chair, the building exterior shall be visually inspected and where necessary, appropriate measures shall be taken to ensure that building features such as sharp edges of parapets, window frames, ledges, cornices or overhangs cannot impair the structural integrity of the support system or associated fall protection rigging. Padding when used, shall be secured to prevent its dislodging from the surface to be protected. These measures shall be incorporated into the work plan in accordance with Section 1.7 of this Standard.

5.6.9 No window cleaner shall attempt to clean any surface beyond his reach. Swinging, swaying or any other maneuver to increase the work area shall be prohibited.

5.6.10 All components shall be inspected before use. Any components with defects shall be immediately removed from service, tagged with a label which states, "Dangerous, Do Not Use", then restored or destroyed. Improvised repairs are prohibited.

5.6.11 Where used, manual swinging scaffolds and boatswain's chairs may be suspended from any of the devices complying with and referenced in Sections 9 and 17. All primary support equipment components of the system shall be capable of supporting, without failure, a load of four times the intended load, but not less than 1200 pounds (544 kg).

5.6.12 Only two persons may use/work on any swinging scaffold at any one time. All work shall be performed between the two stirrups or hangers.

5.6.13 When a block and tackle is used with a boatswain's chair, a person shall be stationed beneath it at all times to assist the window cleaner on the chair.

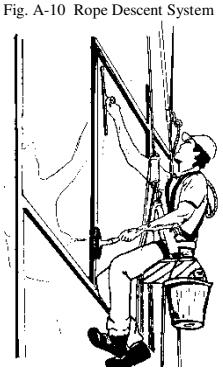
5.6.14 Where a manual hoist is used, it shall be of an accepted design and shall be provided with a secondary brake.

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5.6.15 Prior to assembling, moving and disassembly of a manual scaffold or boatswain's chair, proper danger signs and barricades shall be in place in accordance with Section 3.10 of this Standard. Where it may be a danger to the public, window cleaning tools shall be secured to the scaffolding or boatswain's chair in order to prevent them from falling.

5.7 Rope Descent Systems (RDS)

Fig. A-10 Rope Descent System



5.7.1 When such equipment is used for window cleaning applications, its design, use and maintenance shall conform to the provisions of Section 14 of this Standard for rope descent systems and in accordance with the manufacturer's instructions. Only equipment designed in accordance with Section 3.2 and intended for use in commercial applications shall be used.

5.7.2 Employees shall be trained in the use and care of rope descent systems before they are permitted to use such equipment. Training shall include but not be limited to understanding the manufacturer's instructions, inspection of components, accepted rigging practices, identifying anchorages, descending, fall arrest requirements, rescue consideration and a full understanding of safe working conditions considering as a minimum, correct rigging, rope use, inspection and care and the effects of wind on suspended operations.

5.7.3 Prior to assembling, the operator shall inspect the components of the rope descent system and all safety devices including ropes, harnesses, rope grabs, lanyards, descent devices, chairs and hardware for their general condition. Those components which have defects shall be immediately removed from service, tagged or marked with a label which states, "Dangerous, Do Not Use", then restored or destroyed. Improvised repairs are prohibited.

5.7.4 Rope descent systems shall be stored in such a manner as to provide ease of access or inspection and to prevent danger of an accident when withdrawing the equipment for use. Components shall be stored at a location where they will be protected from the elements. Working surfaces shall be kept free from grease, oil or other slippery substances. Ropes shall be stored in a cool, dry, dark environment.

5.7.5 Prior to making a descent, the building exterior shall be visually inspected and where necessary, appropriate measures shall be taken to ensure that building features, such as sharp edges of parapets, window frames, open projected windows and cornices or overhangs cannot impair the structural integrity of the RDS or associated fall protection rigging. When used, padding shall be secured to prevent its dislodging from the surface to be protected. These measures shall be incorporated into the work plan in accordance with Section 1.7 of this Standard.

5.7.6 Operators of rope descent systems shall utilize and be safely secured to an independent fall arrest system complying with Section 3.8 and 5.7.4 and Section 9.2.

5.7.7 Workers shall wear and completely assemble their personal fall arrest equipment prior to approaching the point of suspension.

5.7.8 The worker shall be secured within the seatboard and fall arrest equipment prior to being suspended. Workers shall maintain their connection to a primary descent system and fall arrest system at all times when suspended. Disconnecting from either system while suspended is strictly prohibited.

5.7.9 Rope shall be rigged through the descent device with the appropriate number of wraps or friction points so as to ensure a controlled rate of descent. The diameter and construction of the rope used shall correspond to the manufacturer's specified rope diameter. Descent devices shall be connected to a seatboard using a double acting carabiner of manual or auto locking design. The attachment point on the descent device shall be of one piece construction with no gates or openings.

5.7.10 While suspended, window cleaners shall not reach further than six (6) feet (1800 mm) in any direction as measured from the plum line of the suspension point on the bearing point on the building. Rapid descents, excessive swinging and sudden stops are prohibited.

5.7.11 Anyone using a rope descent system, should have available at the jobsite at least one other co-worker equally proficient in the use of the system and rescue procedures. When performing descents over 130 feet (40 m), special attention shall be given to prevent against the danger associated with the following industry recognized hazards:
a) the potential of sudden climactic changes such as wind gusts, micro bursts or tunneling wind currents;
b) the ability of the RDS to function without the user having to apply excessive force;
c) the length of time workers are suspended;
d) the re-rigging and movement of main suspension and safety lines;
e) the ability to provide a prompt rescue in the event of an emergency.

5.7.12 Operators of rope descent systems shall continuously monitor wind speeds and weather conditions throughout the course of operation. Rope descent systems shall not be used for window cleaning when wind speeds become excessive in accordance with Section 3.7 of this Standard. On descents

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higher than 130 feet (40m), provisions shall be made for stabilization. Such provisions may include:
a) continuous; (examples and reference to Part B)*
b) intermittent; (examples and reference to Part B)*
c) work station. (suction cups)
Descents shall not exceed 300 feet (91m) above grade unless the windows cannot be safely and practicably accessed by other means.

* Note: These provisions are under development and consideration.

5.7.13 Operators of rope descent systems shall continuously monitor the condition of all components of the system. Any components subject to constant friction and wear shall be inspected regularly. Manufacturer's instructions with regards to maximum allowable wear points shall be followed. Those components which have defects shall be immediately removed from service, tagged or marked with a label which states, "Dangerous, Do Not Use", then restored or destroyed. Improvised repairs are prohibited.

5.7.14 Extreme care shall be taken when using descent equipment around electrical service or heat sources and turbulent areas such as air vents.

5.7.15 Prior to using a rope descent system for window cleaning, proper danger signs and barricades shall be in place in accordance with Section 3.10 of this Standard. Where it may be a danger to the public, window cleaning tools shall be secured by tool lanyards or other similar methods in order to prevent them from falling.

5.7.16 Working Line Use

(a) Working lines shall not be used longer than two (2) years from date first placed in service or three (3) years from date of manufacture. Ropes shall be selected for specific work tasks based on criteria presented in Section 14.5.

(b) The securing of a rope to an anchor with a knot is permitted providing the specific knot does not decrease the initial breaking strength of the rope below 5000 pounds (2268 kg) considering the operators intended deceleration and the reduction of tensile strength over the course of daily use.

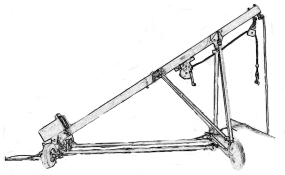
(c) All ropes shall be protected from contact with any surface that may abrade, sever, weaken or damage it.

(d) Ropes shall be inspected according to section 5.7.13 above and a method shall be provided by the employer to identify the use of descent lines and lifelines. Rope shall be removed from service as recommended by the manufacturer or if one of the following conditions is evident or occurs:
1) braids are cut;
2) excessive abrasion has worn fibers;
3) there is hardness or stiffness;
4) dirt or grit has clogged the fibers;
5) rust, tar or grease is present;
6) line size has been reduced;
7) subjected to a shock load;
8) exposed to chemicals that affect their strength;
9) exposed to excessive ultra violet degradation; or
10) working lines that have been subjected to a rapid descent.

5.7.17 Suspension Devices for Rope Descent Systems (RDS)

(a) A rope descent system may be suspended from equipment or anchorages permanently dedicated to the building or equipment that is transported from building to building, providing that the design of the support apparatus and the part of the structure where it is placed has been approved by a registered professional engineer for all loads that will be imposed in accordance with Section 9 and 17 of this Standard.

Fig. A-11 Transportable Counterweighted Outrigger



(b) Portable support devices shall be inspected by a competent person before, during and after daily use. Operator shall as a minimum, check for cracks, bends, missing pins/bolts and other items that may affect the support capability of the device. Those components which have defects shall be immediately removed from service, tagged or marked with a label which states, "Dangerous, Do Not Use", then restored or destroyed. Improvised repairs are prohibited.

(c) Portable support devices shall be assembled according to the manufacturer's instructions and specifications and shall provide a minimum 4 to 1 ratio against overturning. Weights used to counterweight a transportable support device shall be non-flowable and secured to the device using means for positive engagement. Portable support devices shall be tied-back to a certified anchorage on the building with a rope equivalent in strength to the suspension rope.

(d) Every primary line, lifeline and tie-back line, shall be attached with minimal slack to an identified anchorage in line (within 15 degrees of perpendicular) [see appendix]with the area being accessed. The anchorage shall comply with Section 9 of this Standard. Tie-back lines shall be constructed of wire rope or static fiber rope with minimal stretch characteristics whose breaking strength is greater than or equal to that of the primary suspension line.

(e) A portable support device which uses the parapet wall for support is acceptable under the following conditions:
1) the support capability of the parapet has been approved in accordance with Section 1.6.2;
2) the support device meets the requirements of Section 17.5;

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3) the location(s) on the parapet have been identified in compliance with Section 1.7.
4) The use of portable outriggers with wheels at their fulcrum point that rest on the building parapet are prohibited.

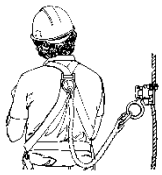
(f) Horizontal movement of a worker suspended from a transportable device is strictly prohibited unless:
1) it is designed to be rolled under load without disassembly and re-assembly;
2) it maintains an overturning stability of at least 4 to 1;
3) its tie-back anchorage and safety line anchorage are independent of each other and have been specifically designed for such movement and repositioning under load and;
4) a method is used to protect the suspension lines and lifelines from abrading horizontally against the roof edge, parapet wall or other building feature or appurtenance;
5) employees moving transportable devices shall be tied off with a personal fall protection system as outlined in section 9.2.

(g) Attaching lifelines or suspension lines to or through free standing or free hanging weights is strictly prohibited.

5.7.18 Fall Arrest Systems for RDS

(a) The components of an independent fall arrest system shall comply with the requirements found in Section 9.2.2 of this Standard. Components of the fall arrest system that do not meet these requirements are strictly prohibited.

Fig. A-12 Fall Arrest System for RDS



(b) The lifeline of the system shall always be anchored in line (within 15 degrees of perpendicular) [see appendix] with the suspended worker.

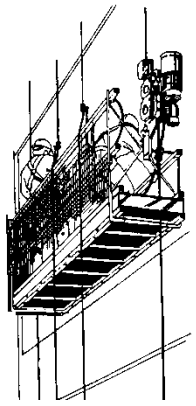
(c) The lanyard and rope grab assembly shall limit a free fall to no more than 6 feet (1800 mm) and shall have shock absorbing characteristics.

(d) Operators of a rope descent system shall wear a full body harness with the attachment in the upper torso located either in the front or back. In the case of an upper torso front attachment, the overall lanyard length shall not exceed 24 inches (610 mm). In the case of an upper torso rear attachment, the overall lanyard length shall not exceed 48 inches (1200 mm).

(e) Fall arrest equipment shall remain engaged when the worker is exposed to a fall and during the entire length of the descent and shall not be removed until the worker has reached the ground or safe working level.

5.8 Transportable Suspended Powered Platforms (single and multiple suspension)

Fig. A-13 Transportable Suspended Power Platform



5.8.1 When such equipment is used for window cleaning applications, its design, use and maintenance shall conform to the provisions of Section 15 of this Standard for suspended scaffolding and in accordance with the manufacturer's instructions.

5.8.2 Employees shall be trained in the use and care of suspended scaffolding before they are permitted to use such equipment. Training shall include but not be limited to understanding the manufacturer's instructions, inspections, assembly of components, accepted rigging practices, motor use, steel wire use, fall arrest requirements, rescue consideration and a full understanding of safe working conditions considering as a minimum, correct rigging, basic electrical concepts and care and the effects of wind on suspended operations.

5.8.3 Prior to assembling, a competent person shall inspect the components of the suspended scaffolding and all safety devices including motors, brakes, wire rope, stirrups/hangers, decking, guardrails, electrical devices, rigging equipment, ropes, harnesses, rope grabs and lanyards for their general condition. Those components which have defects shall be immediately removed from service, tagged or marked with a label which states, “Dangerous, Do Not Use”, then restored or destroyed. Improvised repairs are prohibited.

5.8.4 Suspended scaffolding and its components shall be stored in such a manner as to provide ease of access or inspection and to prevent danger of accident when withdrawing the equipment for use. Components shall be stored at a location where they will be protected from the elements. Working surfaces shall be kept free from grease, oil or other slippery substances. Wire rope shall be stored in a dry environment away from corrosive materials, coiled with its lay and tied to prevent uncoiling.

5.8.5 Prior to accessing the facade, the building exterior shall be visually inspected and, where necessary, appropriate measures shall be taken to ensure that building features, such as sharp edges of parapets, window frames, open projected windows and cornices or overhangs cannot impair the structural integrity of the suspended scaffolding or associated fall protection rigging. These measures shall be incorporated into the work plan in accordance with Section 1.7 of this Standard.

5.8.6 Operators of a transportable suspended scaffold shall utilize and be safely secured to an independent fall arrest system complying with Sections 3.8, 5.8.4 , 9.2.2 and 15.2.

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5.8.7 Operators of the scaffolding shall have a means of communication to a point inside the building or to a company representative.

5.8.8 Operators of transportable suspended scaffolding shall continuously monitor wind speeds and weather conditions throughout the course of operation. Transportable suspended scaffolding shall not be used for window cleaning when wind speeds become excessive in accordance with Section 3.7 of this Standard. On elevations higher than 130 feet (40 m), provisions shall be made for stabilization. Such provisions may include:
a) continuous; (examples and reference to Part B)*
b) intermittent; (examples and reference to Part B)*
c) work station and or angulated roping; (examples) When only work station and or angulated roping stabilization is possible, descents shall not exceed 300 feet (91m).

* Note: These provisions are under development and consideration.

5.8.9 During the use of transportable suspended scaffolding methods shall be used to eliminate the danger associated with the following industry recognized hazards:
a) the potential of sudden climactic changes such as wind gusts, micro bursts or tunneling wind currents;
b) the re-rigging and movement of main suspension and safety lines;
c) the ability to provide a prompt rescue in the event of an emergency.

5.8.10 Transportable ground rigged suspended platforms shall not be used above 300 feet (91m) unless the platform can be continuously stabilized.

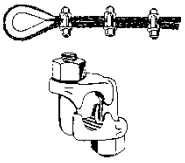
5.8.11 Operators of transportable suspended scaffolding shall continuously monitor the condition of all components of the system. Any components subject to constant vibrations, friction and wear shall be inspected regularly.

5.8.12 Extreme care shall be taken when using suspended scaffolding around electrical service or heat sources.

5.8.13 Operators shall exercise caution while ascending and descending the building facade. Special attention shall be given to avoid snagging the scaffold on building components.

5.8.14 The number of J-clamps on each supporting steel wire rope shall be at least 3 and spaced evenly. J-clamps shall be checked each day during the course of using the suspended scaffolding. U-clamps are prohibited.

Fig. A-14 J-Clamps for wire rope



5.8.15 Operators shall rig the scaffolding to ensure that the distance from motor to motor and motors to the workface are in line and parallel.

5.8.16 All electrical lines shall be padded wherever contact with the building surface may cause abrasion. Electricity shall be disconnected when not in use.

5.8.17 It is prohibited to modify the operating controls of the hoist motors. (i.e.; tying them off)

5.8.18 If the scaffolding is left suspended when not in use, it shall be securely lashed or tied in to the building or workface.

5.8.19 Prior to unloading, rigging and using transportable suspended scaffolding for window cleaning, proper danger signs and barricades shall be in place in accordance with Section 3.10 of this Standard. Where it may be a danger to the public, window cleaning tools shall be secured to the worker or platform in order to prevent them from falling.

5.8.20 Single Point Suspended Working Platforms

(a) Occupants of single point suspended working platforms shall have a fall protection system complying with Section 15.2 of this Standard.

(b) The operator shall either secure his/her safety harness and lanyard to a designed anchorage on the platform or use an independent vertical lifeline.

5.8.21 Suspension Devices for Transportable Suspended Powered Platforms

(a) Transportable powered platforms may be suspended from equipment or anchorages permanently dedicated to the building or equipment that is transported from building to building, providing that the design of the support apparatus and the part of the structure where it is placed has been approved by a registered professional engineer for all loads that will be imposed in accordance with Section 9 and 17 of this Standard. Suspension to permanent equipment or anchorages shall be in a straight line with no more than 15 degrees angulation [see appendix] in either direction.

(b) Portable support devices shall be inspected by a competent person before, during and after daily use. Operators should check for cracks, bends, missing pins/bolts and other items which may affect the support capability of the device. Those components which have defects shall be immediately removed from service, tagged or marked with a label which states, “Dangerous, Do Not Use”, then restored or destroyed. Improvised repairs are prohibited.

(c) Portable support devices shall be assembled according to the manufacturer’s instructions and specifications and shall provide a 4 to 1 ratio against overturning. Weights used to counterweight a transportable support device shall be non-

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flowable and secured to the device using means for positive engagement.

(d) Support devices requiring a tie-back shall be attached with minimal slack to an identified anchorage located in line (within 15 degrees of perpendicular) [see appendix] with the support device. The anchorage shall comply with Section 9 of this Standard. Tie-back lines shall be of wire rope whose breaking strength is greater than or equal to that of the primary suspension line.

(e) A portable support device which uses the parapet wall for support is acceptable under the following conditions:
1) the support capability of the parapet has been approved in accordance with section 1.6.2;
2) the support device meets the requirements of section 17.5;
3) the location(s) on the parapet have been identified in compliance with Section 1.7.
4)The use of portable outriggers with wheels at its fulcrum point that rest on the building parapet are prohibited.

(f) Horizontal movement of a worker or platform suspended from a transportable device is strictly prohibited unless:
1) it is designed to be rolled under load without disassembly and re-assembly;
2) it maintains an overturning stability of at least four to one;
3) its tie-back anchorage and safety line anchorage have been specifically designed for such movement and repositioning under load with a means to protect the suspension lines and lifelines from abrading horizontally against the roof edge, parapet wall, building features or appurtenances.

(g) Attaching lifelines or suspension lines to or through free standing weight(s) is prohibited.

5.8.22 Fall Arrest Systems for Suspended Scaffolding

(a) The components of an indepependent fall arrest system shall comply with the requirements found in Section 9.2.2 of this Standard. Components of the fall arrest that do not meet these requirements are strictly prohibited.

Fig. A-15 Fall Arrest System for Suspended Scaffolding



(b) The lifeline of the system shall always be anchored in line (within 15 degrees of perpendicular) [see appendix] with the suspended worker or platform.

(c) Anchorage of the lifeline should be independent of any portable support device.

(d) The lanyard and rope grab assembly shall limit a free fall of no more than 6 feet (1800 mm) and shall have shock absorbing characteristics.

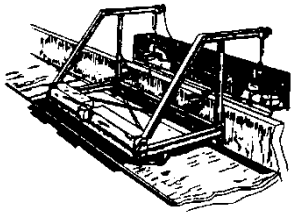
(e) Operators of transportable suspended scaffolding shall wear a full body harness with the attachment in the upper middle back.

(f) Fall arrest equipment shall remain engaged the entire time that workers are suspended by the platform and shall not be removed until the workers have reached the ground or safe working level.

5.9 Permanently Installed Powered Platforms

5.9.1 When such equipment is used for window cleaning applications, its design, use and maintenance shall conform to the provisions of Section 16 of this Standard for permanently installed powered platforms and in accordance with the manufacturer's instructions.

5.9.2 Employees shall be trained by a competent person in the use and care of suspended platform before they are permitted to use such equipment. Training shall include but not be limited to understanding the manufacturer's instructions, inspections, assembly of components, accepted rigging practices, motor use, steel wire use, fall arrest requirements, rescue consideration and a full understanding of safe working conditions considering as a minimum, correct rigging, basic electrical concepts, and care and the effects of wind on suspended operations. The training will be validated and a copy kept on file by the window cleaning contractor and be readily available to the building manager upon request.



5.9.3 It shall be the building owner, manager or operating agents responsibility to have the installation inspected on a regular basis in compliance with OSHA 29 CFR 1910.66. A copy of the inspection shall be given to the window cleaning contractor prior to the equipment being used. The employer shall not permit employees to use the installation prior to receiving assurance from the building owner that the installation meets the requirements contained in this Standard.

5.9.4 Prior to use, the platform shall be inspected by a competent person. Specifically, the components of the powered platform and all safety devices including motors, brakes, wire rope, stirrups/hangers, decking, guardrails, electrical devices, rigging equipment, ropes, harnesses, rope grabs and lanyards shall be checked for their general condition. Those components which have defects shall be immediately removed from service, tagged or marked with a label which states, “Dangerous, Do Not Use”, then restored

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or destroyed. Improvised repairs are prohibited. The unit shall not be used until repairs have been made and the platform re-inspected.

5.9.5 Workers shall continuously monitor the components of the platform while operating it. Special attention shall be paid to wire winders, stabilizing systems and other components that are in constant motion.

5.9.6 Prior to operating a permanently installed powered platform for window cleaning, proper danger signs and barricades shall be in place in accordance with Section 3.10 of this Standard. Where it may be a danger to the public, window cleaning tools shall be secured to the worker or platform in order to prevent them from falling.

5.10 Cleaning The Exterior Surfaces of Operable Windows From Inside the Building

5.10.1 Exterior surfaces of operable windows may be cleaned from inside the building when:
a) they can be safely accessed;
b) all the glass surfaces can be cleaned with only one arm (the part of the body below the worker's shoulder) of the window cleaner extended beyond the outermost glass plane when his or her feet are firmly on the floor or safe working surface without the use of a ladder or other access device;
c) the height of the sill prevents the worker from falling through the opening;
d) the window and all its appurtenances are sound and in proper working order;
e) the worker is protected from falling through the opening, in a manner that complies with Section 3.8 of this Standard.

5.10.2 Typical operable window units that can be safely cleaned this way are:
a) tilt and turn windows;
b) double hung tilt in windows*;
c) double hung "side loaded" windows*;
d) interior swinging casement windows;
e) in and out swinging awnings or projected windows;
f) sliding windows with fixed lights or multiple sliding lights;
g) side loaded sliding windows*;
h) 90 and 180 degree vertical or horizontal pivoting windows.

* To be considered safe to be cleaned this way, these windows shall have their tilt or removable features designed for window cleaning and not for only installation of the window sash.

5.10.3 Safe working procedures.

The following procedures where applicable shall be executed prior to beginning to clean an operable window from the interior.
(a) Where windows are locked, bolted or have limits on the operation of their sash, the key or wrench that is made for the device shall be obtained from the owner along with any manufacturer's instructions.
(b) The work area shall be cleared of obstacles or items that may interfere with safe access to the windows and an adequate area shall be available for the sash when removed or cycled for cleaning.
(c) Barricades, as necessary, shall be provided when the public is in the area.
(d) Jigs or devices to restrain the loose or tilted sash (es) shall be available.

5.10.4 Procedures to be followed while cleaning

(a) Windows not easily unlocked or unbolted or that require excessive force to operate or have any problem that may hinder their closing or reinstallation shall not be accessed for cleaning. The problem shall be reported to the building owner or operating agent.
(b) Window sashes and components shall be carefully handled and not placed in a position that may allow them to fall or shift.
(c) Window components, as per their size and weight,shall be handled by an adequate number of persons to ensure that the window sections are in the control of the window cleaner(s).

5.10.5 Procedures for closing or reinstalling the sash after cleaning.

(a) Windows shall be carefully closed and/or have their components reinstalled to allow them to function in the same manner and with the same operating forces they were as prior to their cleaning.
(b) Windows that have locks, bolts or limits on their sashes shall have them reinstalled.
(c) All windows serviced shall be operated through their cycles to test that they are fully operational and that their locks, limits, etc. are secure. Windows that do not maintain their open positions, (i.e.; a double hung window that will not stay raised) shall be reported to the owner or operating agent.
(d) Keys, tools and instructions furnished to the window cleaners for their use shall be returned to the building owner.

5.11 Handling of Ropes and Lines

Mechanical means shall be provided for raising and lowering lines (wire rope, fiber and cable) when the entire line's weight exceeds 55 pounds (25 kg).

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6 PROHIBITED EQUIPMENT FOR WINDOW CLEANING

6.1 Portable Sills: The use of portable sills is prohibited.

6.2 Window Jacks: The use of window jacks is prohibited.

6.3 Materials: The use of any material that is manufactured exclusively of natural products (such as cotton, hemp or leather) other than wood is prohibited. This section only applies to materials which are components of an access or fall protection system. This section does not apply to equipment prohibited in Section 10.2.2 (a)

6.4 Capstan devices shall not be used for suspending workers.

6.5 Ascenders shall not be used as a part of a fall arrest system.

6.6 Standing lines shall be used as sway protection for suspended equipment only when another means of stabilization cannot be employed, and then such a system shall be designed by a registered professional engineer familiar with those types of powered platform installations.

6.7 Unless designed by a registered professional engineer, horizontal lifelines shall be prohibited.

6.8 Ropes made entirely of polypropylene are prohibited.

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PART B- BUILDING AND EQUIPMENT DESIGN REQUIREMENTS

7 BUILDING REQUIREMENTS

Part A and Part B of this Standard are interdependent. Although specific references may not be provided, designed features provided in Part B must be implemented in accordance with the provisions contained in Part A.

7.1 Applicability

7.1.1 All buildings where window cleaning is performed in accordance with Section 1.3 and employing suspended equipment shall be equipped with roof anchorages or other approved devices that will provide for safe use of the equipment in conformance with the provisions of this Standard.

7.1.2 Window cleaning performed that employs other methods than those complying with Section 4.1.1 shall have or utilize approved devices that will provide for safe working procedures in conformance with the provisions of this Standard.

7.1.3 Sections 7.1.1 and 7.1.2 apply to a dwelling house over 3 full stories high or occupied by more than 3 families.

7.2 Means and Methods

7.2.1 Buildings erected or substantially remodeled after the adoption of this Standard shall be equipped with the appropriate means and methods necessary to comply with the provisions of this Standard.

7.2.2 Existing buildings without means and methods to safely clean its windows shall be provided with such a system and/or employ methods complying with the provisions of this Standard.

7.2.3 Transportable equipment used to access a building's interior or exterior façade shall be designed and used in accordance with the requirements of this Standard.

7.2.4 Buildings with an existing window cleaning system shall provide and maintain means and methods to access its facade in accordance with the standards in force at the time of the building's original construction and shall provide fall protection for window cleaners complying with Section 9.2 of this Standard.

7.2.5 Buildings with a permanent installation system shall not have the system diminished unless it has decayed beyond its ability to be renovated. In such cases an equivalent or alternate system approved by a registered professional engineer experienced in such design shall be installed in strict accordance with the applicable sections of part B of this Standard.

7.2.6 Existing buildings without provisions for a window cleaning system may provide a combination of building supplied fall protection and anchorages plus window cleaning contractor supplied transportable equipment or a window cleaner's belt anchor system. Where such a decision is selected roof anchorages, supporting fixtures, window cleaner's belt anchors and/or transportable equipment shall be designed, manufactured, installed, operated and maintained in accordance with applicable portions of Part B. Fall protection provisions shall comply with Section 9.2. Wind sway protection, where required, shall comply with Section 15.14.

7.3 Maintenance, Servicing and Upkeep

7.3.1 Equipment is susceptible to slow degradation, particularly equipment and its components that are stored outside. Geographic regions of the country near oceans experience salt air corrosion capable of destroying structural components of exterior equipment at a rapid rate. In addition to complying with Section 8, maintenance contractors hired to inspect, service and maintain equipment on existing buildings shall cite conditions of decay within the installation. Indications of decay shall be brought to the attention of building owners or their operating agents and shall be noted in the log book. Decay to the equipment or its components shall be halted and the equipment restored to a like new condition.

7.3.2 All aspects of transportable equipment and the installation shall be maintained by a qualified person in strict accordance with its vendor's and/or manufacturer's maintenance frequencies, instructions and guidelines. Log books shall be established and maintained; one that is on file at the building for equipment and anchorages dedicated to the building and one kept by the window cleaner for his transportable equipment, recording each major maintenance activity, the date of the maintenance activity, and signature of the inspector.

7.3.3 Equipment that is infrequently used (its use cycle exceeds a twelve month period) shall be inspected prior to use, and any required maintenance shall be completed before the equipment is put into service. Corroded, damaged or defective equipment including transportable equipment, shall not be used and immediately removed from service until such damage or defects are corrected or the affected parts replaced.

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7.4 Limits for a window to be classified as safe for window cleaning.

The following limitations on a window will consider it to be safe or unfit for being cleaned by one or more workers.

7.4.1 Windows requiring a breakaway* force in the direction of the windows operation or in force applied to a crank, lever or other mechanism in excess of 45 pounds (20 kg) shall be considered unsafe unless a means is provided to assist the worker.

7.4.2 Windows requiring an operating force in excess of 35 pounds (16 kg) shall be considered unsafe unless a means is provided to assist the worker.

7.4.3 Any removable window section that weighs in excess of 45 pounds (20 kg) shall require two window cleaners to handle it. The maximum weight of any window section to be removed and replaced, as with a side-loaded window, shall be limited to 80 pounds (36 kg) when the reach distance from the sill to the window track is less then 12 inches (305 mm). For reach distances over 12 inches (305 mm) the allowable maximum window section weight shall be diminished proportionally. The maximum reach distance for a removable section shall be 24 inches (610 mm).

7.4.4 Tilt window sections in excess of 60 pounds (27 kg) shall require two window cleaners to handle it. The maximum weight of any window section to be tilted (lowered or raised) shall be limited to 100 pounds (45 kg).

7.4.5 A window opening shall begin no less then 36 inches (914 mm) above the floor or safe work surface below it and when open for cleaning not present an opening in excess of 22 square feet (6.7 m) unless it is a double hung tilt in window then the opening shall not be in excess of 39 square feet (12 m).

*Note: For the purpose of this Standard, a "breakaway force" is the initial force required to overcome the effects of weather stripping and seals in the window's design. The direction of the window is the path that the window sash is operable in, (i.e.; up and down for a double hung window, in or out for a projected window, etc.). Operating force is the exertion required after the breakaway is achieved to operate the window when the operator (the vertical line from the centerline of the operator's feet) is within 12 inches (305 mm) of the sash or operating device.

8 INSPECTION AND TESTING

8.1 General Inspections

(a) All aspects of the installation shall be serviced and maintained in strict accordance with its manufacturer's frequency and instructions and shall be further inspected, maintained and tested in accordance with Section 7.3.

(b) Components that were originally required to be designed by a registered professional engineer, which show signs of wear or distress in the inspection process, shall be reviewed by a qualified person to determine whether testing is required as a supplement to the visual inspection process. If testing is deemed necessary, a registered professional engineer shall prescribe a test procedure and shall certify its results.

(c) Upon completion of the inspection and testing, a thorough description of findings and/or test results shall be entered into the equipment's logbook, signed and dated.

8.1.1 Newly Installed Equipment

(a) Before initial use by the window cleaner(s), the following equipment (as provided for a specific building) shall be successfully demonstrated by the vendor with the rated load under the complete range of operation and be so certified in writing:
1) permanently installed access platform(s) or its supporting fixtures;
2) anchorages;
3) window cleaner's belt anchors;
4) fall protection systems;
5) wind sway protection systems.

(b) Portable support equipment such as davits, outriggers, parapet clamps, cornicehooks, etc. shall be tested in the shop or on the building's roof. Shop testing shall be performed at least 2.5 times the rated load of the apparatus. Designated equipment targeted for post-installation testing of such equipment shall not exceed twice their rated load. Deflection in the equipment's primary support member shall be measured during the test and compared to the theoretical design values at equivalent loading.

8.1.2 Inspection and Re-Testing of Existing Equipment & Systems

(a) Before each use, all components of a window cleaning equipment support system permanently dedicated to the building shall be visually inspected by a competent person. Any signs of excessive wear, weld or material cracks, bent, distressed or rusted metals, corrosion or abraded fibers shall be cause for more extensive inspection or testing before continued use.
(b) Any missing components shall be documented and the system shall not be used until such components are replaced or repaired by the equipment owner. Replacement of parts or components shall be of like strength, finish and durability of that originally provided. A record of all inspections, testing certifications, modifications and repairs shall be documented in a dedicated log book.
(c) The certification record shall include the date of the inspection and test and the signature of the inspector.

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8.1.3 Minimum Inspection and General Testing Criteria

(a) Fall arrest components shall be inspected and tested as prescribed by ANSI Z359.1.
(b) Anchorages shall be inspected in accordance with Section 8. Designated anchorages, targeted for post-installation testing, shall be tested by applying a minimum static load of twice the design load in each (primary) direction that a load may be applied. For example, an anchorage with an ultimate capacity of 5000 pounds (2268 kg) has a four to one safety factor. Therefore the anchor's design load is 1,250 pounds (567kg) and it shall be tested at 2500 pounds (1134 kg).
(c) Wire Rope: Wire rope used for primary or secondary support rope or wire rope used as a horizontal lifeline shall be visually inspected by a qualified person prior to each use. Any of the following conditions or combinations of conditions, shall be considered as significant reason for the removal of the rope from service:
1) four randomly distributed broken wires in three lays or two broken wires in one strand in three lays;
2) distortion of rope structure such as would result from crushing, kinking or bird-caging;
3) evidence of heat damage;
4) noticeable rusting, corrosion, pitting or more than two broken wires in the vicinity of the end attachments;
5) evidence of core failure (lengthening of rope lay and a reduction in rope diameter suggests core failure);
6) more than one valley break (broken wire). A wire break in the valleys between strands indicates an abnormal condition, possibly fatigue and breakage of other wires that are not visible;
7) reduction from original diameter by more than the following amounts:
A) 1/64 inch (.4 mm) for 5/16 inch (8 mm) diameter rope;
B) 1/32 inch (.8 mm) for 3/8 inch (9.5 mm) to and including 1/2 inch (13mm) diameter ropes;
C) 3/64 inch (1.2 mm) for 9/16 inch (14 mm) to and including 3/4 inch (19 mm) diameter wire ropes.
(D) Powered equipment permanently dedicated to the building shall be inspected and tested by a qualified person in strict accordance with manufacturer's instructions and in accordance with ASME A120.1.
(E) Transportable equipment, particularly powered hoists, shall be inspected and tested by a qualified person in strict accordance with the manufacturer's instructions and as follows:
1) each day, before initial use, the hoist shall be tested in the lifting direction with the intended load to make certain it has sufficient capacity to raise and lower the operators plus any additional live load; and
2) at intervals not exceeding one year, special inspections and tests of the governor and secondary braking system shall be made as follows:
A) the inspection and testing shall include a verification that the initiating device for the secondary braking system operates at the proper over-speed;
B) if any hoisting machine or initiating device for the secondary brake is removed from the equipment for testing, all reinstalled and directly related components shall be re-inspected prior to returning the equipment to service;
C) if adequate tests can not be made in the field or where the hoists are stored, the initiating device may be removed from the equipment and sent to a shop equipped to make such tests.

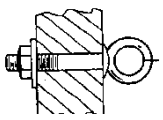
8.1.4 Inspection and Testing of Window Anchors

(a) Inspection of window anchors, fittings and their attachments on buildings shall be conducted routinely, at least annually. Special attention shall be given to older buildings that still have cast bronze or brass anchors. The tendency of cast anchors to fail drop tests requires the periodic removal of a sampling of these style anchors for their drop testing by qualified persons.
(b) For each building requiring anchors to be certified as acceptable, a protocol shall be established for the testing of a representative sampling of each type of anchor installation on each face of the building containing anchors. Only anchors that conform to the requirements of this Section shall be tested. Anchors not conforming to the requirements of this Standard shall be considered substandard and shall no longer be used. To pass the testing process, a window anchor must withstand the drop test specified in Section 10.2.4.
(c) Window anchors that are to be abandoned for use when operable windows are permanently sealed or replaced with fixed windows but are to be reclassified as intermittent stabilization anchors shall be tested as follows:
1) A representative sampling of each type of anchor on each face of the building shall be selected and subjected to a pull test of 300 pounds (136 kg) in each outward direction.
2) Failure of any one anchor, including bending or loosening from its mooring, shall be cause for an increased test sampling.

9 ANCHORAGES and FALL PROTECTION

9.1 Design Criteria

Fig. B-1 Cutaway Anchor



9.1.1 Anchorages shall be capable of sustaining a 5000 pound (2268 kg) minimum load or a minimum 4-to-1 safety factor, whichever is greater, in any direction that a load may be applied.

9.1.2 Anchorages, if used for more than one lifeline, shall have the load factor multiplied by each user.

9.1.3 If anchorages are used simultaneously as an equipment* tie-back and a lifeline anchorage, they shall be

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capable of supporting the anchorage load factor multiplied by the combo of the fall arrest load and the tie-back load. (*denotes equipment described in Section 17.5)

9.1.4 Anchorages using adhesive fasteners (epoxy anchors) to a structure shall have a minimum of two fasteners per anchorage.

9.1.5 Anchorages which have a surface permanently concealed from view shall be made of austenitic steel or shall be constructed of other noncorrosive, non-metallic material that has the necessary durability to withstand equipment impact loads and physical abrasion.

9.1.6 Anchorages shall be unobstructed and located behind and in line with the equipment or portion of the building they are intended to service and shall be free of sharp edges that may cause damage to the appurtenances attached to them.

9.1.7 When anchorages are used to directly support suspended equipment, existing roof parapets and guardrails subjected to the direct loading of suspension lines shall be structurally analyzed by a registered professional engineer, considering these added loads, and verified as to their capacity.

9.1.8 Each anchorage shall be identified in the work plan in accordance with Section 1.7.

9.1.9 Anchorages shall be inspected annually by a qualified person. Anchorages shall be re-certified when re-roofing or renovating (pertinent to the window cleaning system) or at periods not to exceed 10 years. The report of this inspection shall be included in the building's log book. If during the anchorage's inspection an area of suspicion is identified, a test procedure, if necessary, shall be performed under the approval of a registered professional engineer.

9.1.10 Certification and re-certification of anchorages shall be under the supervision of a registered professional engineer.

9.1.11 A horizontal (rope) line may be used as an anchorage or may be a fundamental part of a fall arrest system. In all cases, horizontal lines shall be designed by or under the direct supervision of a registered professional engineer experienced in such designs.

(a) Where installed and used as a part of a personal fall arrest system, horizontal lifelines and their anchorages shall maintain a safety factor of at least 2 over and above the design allowable as prescribed by recognized design Standards for the chosen material, e.g. the AISC Manual For Steel Construction or the Aluminum Association's "Aluminum Design Manual" if constructed of aluminum.

(b) On suspended scaffolds or similar work platforms that are supported by 4 independent wire ropes, operators may be equipped with and use a horizontal lifeline or retracting lanyards attached to a structural element of the work platform. The platform's attachment point shall be specifically designed for such loading.

9.2 FALL PROTECTION

9.2.1 Perimeter Guarding

(a) Perimeter guarding shall consist of a parapet, guardrail or combination parapet guardrail system not less than 42 inches (1.1 m) above its adjacent surface and capable of with-standing a minimum lateral force of 50 pounds (23 kg) per linear foot between any two stanchions (applied at its uppermost elevation) or a minimum of 200 pounds (91 kg) of lateral force concentrated at any point along its length at its uppermost elevation. Parapets and guardrails which may be subjected to additional loading such as lifelines, power cables, etc., shall be designed to consider these added loads.

(b) Buildings with tall parapets, those exceeding 6 feet (1800 mm) in height, shall have either:
1) a catwalk;
2) an inboard mobile access tower; or
3) an engineered fall protection or fall arrest system.
Item (2) may be provided by the window-cleaning contractor. Perimeter guarding for permanent roof carriage installations shall be designed in accordance with applicable provisions of ASME A120.1. Parapets over 48 inches (1200 mm) in height present a falling hazard to the inboard roof surface as fall arrest systems only perform when the fall is away from their anchorage or outboard. Care must be exercised to prevent such a fall.

9.2.2 Personal Fall Arrest System

(a) All workers shall use a full body harness as a part of their complete fall arrest system and all components of that fall arrest system shall comply with ANSI Z359.1 with the following exceptions:
1) window cleaner's belts used during the cleaning of operable windows.
(b) In addition to complying with ANSI Z359.1, rope grabs used for fall arrest shall include by design, an anti panic stop feature.
(c) All components of the fall arrest system shall be compatible.
(d) Components of the fall arrest system subjected to an impact load shall be immediately removed from service and shall not be used again for employee protection.
(e) Lifelines shall be protected from contact with any surface that may abrade, sever, weaken or damage it. Ropes shall be inspected according to Section 5.7.16(d) and a means shall be provided by the employer to identify and log the use of lifelines. The securing of a rope to an anchor with a knot is permitted providing the specific knot does not decrease the initial breaking strength of the rope below 5000 pounds

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(2268 kg) considering the operators intended deceleration and the reduction of tensile strength over the course of daily use.

Rope shall be removed from service as recommended by the manufacturer or if one of the following conditions is evident or occurs:
1) braids are cut, or
2) excessive abrasion has worn fibers, or
3) there is hardness or stiffness, or
4) dirt or grit has clogged fibers, or
5) rust, tar or grease is present, or
6) line size has been reduced, or
7) subjected to a shock load, or
8) exposure to chemicals that affect their strength, or
9) exposure to excessive ultra violet degradation.

(f) Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists.
(g) Personal fall arrest systems, when stopping a fall shall:
1) limit maximum arresting force on an employee to 1800 pounds (8 kN) when used with a body harness;
2) be rigged such that an employee can neither free fall more than 6 feet (1800 mm), nor contact any lower level;
3) bring an employee to a complete stop and limit maximum deceleration travel distance of an employee to 42 inches (1067 mm);
4) have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1800 mm), or the free fall distance permitted by the system, whichever is less.
(h) Anchorages used as a part of the personal fall arrest system shall comply with Section 9.

9.2.3 Personal Fall Restraint System

(a) Positioning devices shall be rigged such that an employee cannot free fall more than 24 inches (610 mm).

(b) Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds (13.3 kN), whichever is greater.

(c) Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.

(d) Connectors shall have a corrosion resistant finish and all surfaces and edges shall be smooth to prevent damage to interfacing parts of this system.

(d) Positioning devices shall be inspected prior to each use for wear, damage and other deterioration, and defective components shall be removed from service.

9.2.4 Warning Line System

(a) Warning line systems, used as a physical barrier to keep workers outside a fall hazard zone, shall comply with the following provisions:
1) shall be erected around all affected roof work areas at a distance of at least 10 feet (3m) from the roof edge which is parallel to the warning line;
2) warning lines shall consist of ropes, chains or wires and supporting stanchions erected as follows:
A) the rope, chain or wire shall be flagged at not more than 6 foot (1800 mm) intervals with high-visibility material;
B) the rope, chain or wire shall be rigged and supported in such a way its lowest point (including sag) is no less than 34 inches (864 mm) from the walking/ working surface and its highest point is no more than 39 inches (1 m) from the walking/ working surface;
C) after being erected, with rope, wire or chain attached, stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds (7.25 kg) applied horizontally against the stanchion, 30 inches (762 mm) above the walking/ working surface, perpendicular to the warning line, and in direction of the floor, roof or platform edge;
D) the rope, wire or chain shall have a minimum tensile strength of 500 pounds (227 kg) and after being attached to the stanchions shall be capable of supporting without breaking, the loads applied to the stanchions as prescribed in para. 9.2.4 (2)(C) of this Section;
E) the line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over.
3) no employee shall be allowed in the area between a roof edge and a warning line unless the employee is equipped with a complete fall arrest system.

10 EQUIPMENT DESIGN REQUIREMENTS

10.1 Ladders

10.1.1 Wood ladders shall comply with ANSI A14.1. Wood ladders shall not be painted with other than a transparent material.

10.1.2 Metal ladders shall meet the requirements of ANSI A l4.2.

10.1.3 Reinforced plastic ladders shall meet the requirements of ANSI A 14.5.

10.2 Window Cleaner’s Belts and Anchors

Operable Windows: Retrofit a Window Cleaner's Anchor (BELT) System

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10.2.1 Window anchors shall be installed, conforming to this Standard, if it is necessary for the window cleaner to work from outside the building more than 48 inches (1200 mm) above grade, or to work from the inside where the window opening is of such size that the window cleaner could fall through the open window, or provisions shall be made for window cleaning by use of other means and methods as specified in subsequent sections of this Standard. An installed anchor shall not be used for any purpose other than attachment of an accepted window cleaner's belt.

10.2.2 Window Anchor Design

(a) Anchors shall be designed for attachment to window frames, mullions and/or components of the structure capable of withstanding the loads by the window cleaning anchors. Anchors shall have at least two bolts or machine screws when said anchor head(s) are not of one-piece design with the bolt forged as part of the anchor assembly. Both anchors and bolts shall be machined or forged from bar stock and treated when required to meet or exceed the required physical and chemical properties as per Section 10.2.3. Cast anchors shall be prohibited, as are the use of eyebolts, mortar hooks and lag screws.

(b) Anchor bodies shall be 7/16 inch (11 mm) $\pm$ 1/64 inch (.4 mm) in diameter and the head shall be 3/4 inch (19 mm) $\pm$ 1/64 inch (.4 mm) across the flat and not less than 5/16 inch (8 mm) thick, and if double headed, so designed and spaced that it will be impossible to attach the window cleaner's terminal to a single head .

(c) Forgings for anchors or bolts shall have 1/8 inch (3.18 mm) radius fillet at each place where the diameters or other dimensions change.

(d) The space between the anchor head and the flange shall not be less than 1/2 in.(13mm) or more than 7/8 in.(22mm)

10.2.3 Anchor Material Specifications

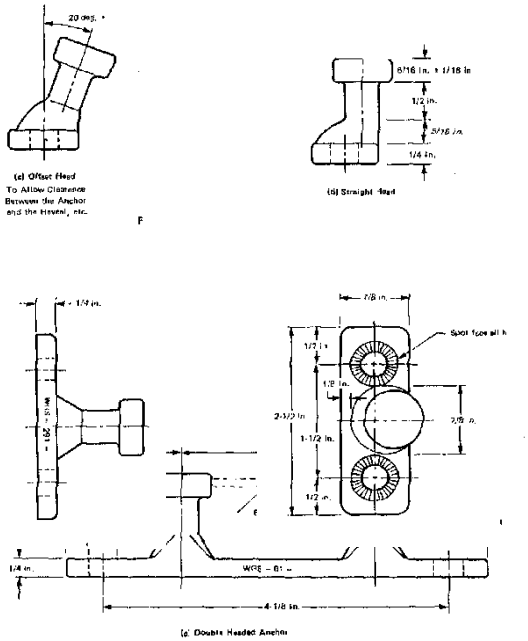
(a) Metals used in the manufacture of anchors and anchor fittings shall be corrosion resistant materials and shall have an ultimate tensile strength of not less than 55,000 psi (3516 kg/cm) with an elongation of at least 25% in 2 inches (51 mm). Metals that have been shown to be satisfactory are stainless steel: UNS Type 304; SAE Type 30304; UNS Type 316; ASTM-A3414 Types 304 and 316.

(b) Machined fastenings and other fittings shall be of the same material as the forgings to which they are attached.

10.2.4 Acceptance Requirements for Belt Anchors and Anchor Fittings
(a) Only accepted anchors and fittings shall be used.
(b) Prototype anchors and fittings shall be tested as specified in (d) below. Such tests shall be performed by a recognized testing laboratory. The laboratory report shall include a detailed description of the test sample, test procedure, and the test results. The sample shall constitute 1% of the lot, but not less than two anchors. A copy of the report shall be made available to any authority having jurisdiction over the use of window anchors. This paragraph pertains to new or prototype anchors of manufacturers. However, all anchors manufactured subsequently shall be monitored to ensure compliance with the Standard.

Such monitoring shall include but not be limited to, chemical and physical testing of the materials by the stainless steel producer's laboratory, drop testing by the anchor manufacturer and, as necessary, testing by a disinterested testing laboratory.
(c) All window anchors shall bear a name or a trade mark which shall readily identify their manufacturer.
(d) All window anchors and anchor fittings as a unit shall be capable of withstanding:
1) a tension pull of 6000 pound (2722 kg) without fracture. This tension is to be applied through a belt terminal in the direction in which the anchor must withstand loading in service if a person should fall;
2) a drop test, with a 250 pound (113 kg) rigid weight, falling a distance of 48 inches (1200 mm) without fracture. The connection between the weight and the anchor shall be 3/8 inch (9.5mm) wire rope, 6 ft (1800 mm) long

Fig. B-2 Single Head and Double Head Anchors



between the ends of its terminal eye splices, with metal thimbles. One eye splice is to be through a standard belt terminal that connects to the anchor.
(e) Window anchors which have been subjected to acceptance tests shall not be used for any purpose except as exhibits for educational purposes.

10.2.5 Fastening Anchors: Window anchors shall be securely fastened to the window frame or mullion at not less than 42 inches (1067 mm) nor more than 51 inches (1295 mm) above the windowsill.

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(a) In wood construction, when the anchor and bolt are forged as one piece, such anchors may be used in single or double configurations when provided with a front collar to prohibit anchor rotation and a rear flat washer of at least twice the diameter of the bolt with a lock washer and nut. The bolt shall be a minimum of 3/8 inch (9.5 mm) in diameter and shall pass through a solid section of the window construction. The drilled hole shall be no more than 1/16 inch (1.59 mm) larger than the bolt, and any excess bolt thread shall be cut off and the thread peened over or upset to prohibit the nut from loosening or being removed. When anchors are employed with separate bolt(s), the preceding conditions will apply, provided that either two machine or carriage bolts are employed or certain special anchor types have one bolt with screws to prohibit anchor movement. All anchors and hardware shall comply with paragraph 10.2.3.

(b) In solid or hollow ferrous metal frame construction, the anchors shall be attached by two 3/8 inch (9.5 mm) diameter bolts which shall pass through the face of the frame and through a minimum 3/8 inch (9.5 mm) thick by 3/4 inch (19 mm) wide steel reinforcing backup bar with a noncorrosive coating applied after fabrication, extending from 5 inches (127 mm) above the upper bolt to 2 inches (51mm) below the lower one. The bolts shall be secured by means of nuts tightened to the torque specified by the bolt manufacturer or secured by other means. Where it is impractical to provide nuts, the reinforcing bar may be tapped to receive the 3/8 inch (9.5 mm) bolts which must pass completely through the bar with a minimum of two threads extending beyond and be tightened to the torque specified by the bolt manufacturer.

(c) In solid or hollow bronze and aluminum frames, the backup bars, in addition to a non corrosive finish shall be electrolytically compatible with the adjacent metals and building components. A plastic gasket shall be placed between the anchor and the frame metal as a means of preventing electrolytic action between metals, or another method accepted by the enforcing authority having jurisdiction, may be used. The installation shall otherwise comply with the provisions of (b) above.

(d) Window anchor fittings having a single threaded section and screwed into the backup bar shall not be acceptable.

(e) The threads of all screws or bolts used in the installation of anchors shall terminate far enough from the head to prevent weakening due to undercutting.

(f) Clearance shall be attained by having the center line of the anchor at least 1 inch (25.4 mm) from obstructions at either side which might interfere with engagement of a belt terminal. Obstructions shall not be allowed within 5 inches (127 mm) above or below an anchor.

(g) Window anchors shall not be installed into existing masonry or concrete walls. Anchors may be installed through existing or new masonry concrete walls when the walls are of solid construction and reinforced to support the load imposed by the addition of window cleaner anchor bolts. Bolts shall pass through at least 7 1/2 inches (191 mm) of solid wall and be at least 8 inches (203 mm) long with a stainless steel backup plate at least 3 1/2 inches (89 mm) squared and 12 gauge in thickness. Bolts shall have lock washers and nuts with any exposed thread cut off and upset to prohibit loosening or removal of nut. Anchors may be installed into new poured concrete construction provided that the bolt goes at least 4 inches (102 mm) into the concrete and that they have either a 2 inch (51 mm) right angle or hook bend on the bolt(s), or a stainless steel plate of at least 12 inches (305 mm) sq. and 12 gauge in thickness as part of the anchor. Any of the above concrete anchorage methods shall be located behind the reinforcing steel bars.

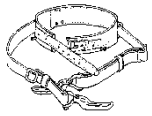
10.2.6 Condition of Window Frames: All window frames to which anchors are attached shall be in sound condition and shall be securely fastened in place.

10.2.7 Test for Total Installation: The manufacturer of any prefabricated window unit intended for installation in new construction or remodeling shall, when requested, submit evidence satisfactory to the authority having jurisdiction that the complete installation including anchors has successfully withstood the drop test specified in Section 10.2.4(d) without failure of the frame at the point of attachment of the anchors and without detachment of the window unit from its attachments to the building or curtain wall section(s).

10.2.8 Replacement Due to Impact: When an anchor is subject to an impact such as the falling of a person engaged in window cleaning, the anchor should be replaced and the window or building component should be examined for possible structural damage and if required, corrected.

10.2.9 A window cleaner's belt shall be made of material that will meet the requirements in (a) through (d).

Fig. B-3 Window Cleaner's Belt



(a) All "soft goods" material shall be either all synthetic (nylon, etc.) or synthetic and natural fibers (cotton, leather, etc.) providing that the natural fibers will not be used as a support component of the belt but only for comfort (as padding) and/or ease of use. Support hardware (terminals, buckles, etc.) shall be of materials conforming to Section 10.2.5. Other hardware such as terminals, keepers, etc., shall be of a non-corrosive alloy.

(b) The body of the belt shall not be less than 3 inches (76 mm) nor more than 4 inches (102 mm) wide or, if the load bearing member is narrower, the belt should be designed so that it shall include a body pad not less than 3 inches (76 mm) nor more than 4 inches (102 mm) wide to provide a reasonable distribution of stress across the window cleaner's back. Leather belts shall be reinforced with nylon webbing.

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(c) The maximum permissible length of a runner on a window cleaner's belt shall be 8 feet (2.4 m) from terminal tip to terminal tip, unless variances are granted by local enforcing agencies.

(d) The belt shall limit the force of a person falling on either one or the other terminal, with the other hanging free, to an initial impact of not more than 2000 pounds (907 kg) for not more than 2 minutes, followed by a force not exceeding 1000 pounds (454 kg) for the prescribed stopping distance.

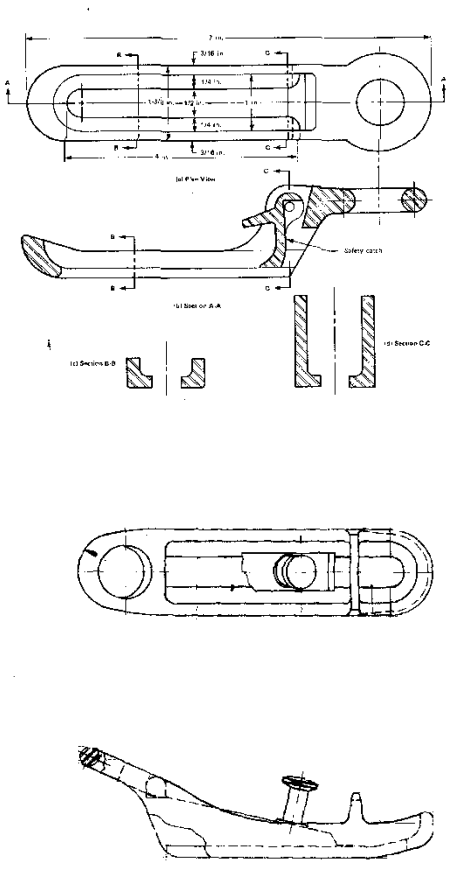
10.2.10 Terminal Design

(a) Terminals shall have a slot 1/2 inch (13 mm) long $\pm$ 1/32 inch (.8 mm) wide by 4 inches (102 mm) long and a recess for the anchor head which shall be 1 inch + 1/16 inch (27 mm) wide. The design of the belt shall also include a safety catch or keeper which shall automatically permit engagement of the terminal on the anchor but shall require positive manual opening before it is disengaged from the anchor head.

(b) Terminals and fittings which are subject to stress during use shall be drop forged from any of the materials specified for anchors in Section 10.2.3(a).

(c) The "spreading" or "squeezing" of terminals is prohibited.

Fig. B-4 Terminal Design for Window Cleaners' Belt



10.2.11 Acceptance Requirements for Belts, Fittings, and Terminals

(a) Only compatible belts, fittings, and terminals shall be used.

(b) The complete belt shall withstand a drop test consisting of a 250 pound (113 kg) weight falling free for a distance of 6 feet (1800 mm). The weight shall be a rigid object of between 36 inches (914 mm) and 42 inches (1066 mm) in girth and weighing 250 pounds (113 kg). The weight shall be placed in the waistband with the belt buckle drawn firmly against the weight, as when the belt is worn by a window cleaner. One belt terminal shall be attached to a rigid anchor and the other terminal shall hang free. The terminals shall be adjusted to their maximum span. The weight fastened in the freely suspended belt shall be lifted exactly 6 feet (1800 mm) above its "at rest" position and released so as to permit a free fall of 6 feet (1800 mm) vertically below the point of attachment of the terminal to the anchor. The belt assembly shall be equipped with some form of recording strain gauge capable of measuring the stress versus time relationship as required by Section 10.2.9(d).

(c) The test criteria for (b) above shall be as follows:
1) there shall be no failure of any part of the belt or its fittings;
2) there shall be no slippage of the buckle on the waistband in excess of 1/4 inch (6.4 mm) from the marked position in which it was originally placed. The mark shall be placed on the tail where it comes through the waistband buckle;
3) the force versus time relationship shall be as specified in Section 10.2.9 (d);
4) the final "at rest" point shall not be more than 48 inches (1200 mm) below the original "at rest" position.

(d) Belts which have been subjected to strength tests shall not be used for any other purpose except as exhibits for educational purposes.

(e) All accepted belts shall bear an identification mark either indelibly printed into the belt or permanently printed or stamped or woven on a permanently attached tag or label which shall identify the manufacturer, the date of the most recent repair, and any acceptance identification number required by the enforcing authority. The same tag/label/identification shall also include the following statement permanently and prominently displayed:
" The use of this belt and the anchorage it is attached to shall be in accordance with this Standard and/or any Federal, State, and local codes. IMPROPER USE IS DANGEROUS AND MAY RESULT IN DEATH OR INJURY. Belts and anchorage shall be inspected before each use. Do not remove or deface any label or markings on this belt".

(f) Harnesses incorporated into the design of the belt may be used if they meet all the criteria of this Section and if they

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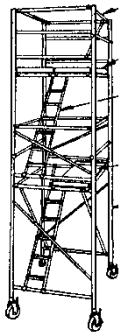
use the same terminal and fitting design. All harnesses or harness belt designs must pass the tests described herein.

11 Aerial Work Platforms (Vehicle Mounted and Manually Propelled)

11.1 Specifications

11.1.1 Work platforms and scaffolds shall be capable of carrying the design load under varying circumstances depending upon the conditions of use. Therefore, all parts and appurtenances necessary for their safe and efficient utilization must be integral parts of the design.

Fig. B-5 Tower Scaffold



11.1.2 Specific design and construction requirements are not a part of this section because of the wide variety of materials and design possibilities. However, the design shall be such as to produce a mobile ladder stand or scaffold that will safely sustain the specified loads. The material selected shall be of sufficient strength to meet the test requirements and shall be protected against corrosion or deterioration.

11.1.3 The design working load of ladder stands shall be calculated on the basis of one or more 200 pound (91 kg) persons together with 50 pounds (23 kg) of equipment each.

11.1.4 The design load of all scaffolds shall be calculated on the basis of:
a) light- designed and constructed to carry a working load of 25 pounds (11.5 kg) per square foot;
b) medium- designed and constructed to carry a working load of 50 pounds (23 kg) per square foot;
c) heavy- designed and constructed to carry a working load of 75 pounds (34 kg) per square foot.

11.1.5 All ladder stands and scaffolds shall be capable of supporting at least four times the design working load.

11.1.6 The materials used in mobile ladder stands and scaffolds shall be of standard manufacture and conform to standard specifications of strength, dimensions, and weights and shall be selected to safely support the design working load.

11.1.7 Nails, bolts or other fasteners used in the construction of ladders, scaffolds and towers shall be of adequate size and in sufficient numbers at each connection to develop the designed strength of the unit. Nails shall be driven full length. (All nails should be immediately withdrawn from dismantled lumber.)

11.1.8 All exposed surfaces shall be free from sharp edges, burrs or other safety hazards.

11.1.9 The maximum work level height shall not exceed four (4) times the minimum or least base dimensions of any mobile ladder stand or scaffold. Where the basic mobile unit does not meet this requirement, suitable outrigger frames shall be employed to achieve this least base dimension, or provisions shall be made to guy or brace the unit against tipping.

11.1.10 The minimum platform width for any work level shall not be less than 20 inches (508 mm) for mobile scaffolds (towers). Ladder stands shall have a minimum step width of 16 inches (406 mm).

11.1.11 The supporting structure for the work level shall be rigidly braced, using adequate cross bracing or diagonal bracing with rigid platforms at each work level.

11.1.12 The steps of ladder stands shall be fabricated with slip resistant treads.

11.1.13 The work level platform of scaffolds (towers) shall be of wood, aluminum or plywood planking, steel or expanded metal for the full width of the scaffold, except for necessary openings. Work platforms shall be secured in place. All planking shall be 2-inches (51 mm)(nominal) scaffold grade minimum 1,500 f. (stress grade) construction grade lumber or equivalent.

11.1.14 All scaffold work levels 10 feet (3 m) or higher above the ground or floor shall have a standard (4 inches [102 mm] nominal) toeboard. All work levels 10 feet (3 m) or higher above the ground or floor shall have a guardrail of 2 by 4-inches (51 by 102 mm) nominal or the equivalent installed no less than 36 inches (914 mm) or more than 42 inches (1067 mm) high with a mid-rail when required, of 1 by 4 inches (25.4 by 102 mm) nominal lumber or equivalent.

11.1.15 A climbing ladder or stairway shall be provided for proper access and egress, and shall be affixed or built into the scaffold and so located that its use will not have a tendency to tip the scaffold. A landing platform shall be provided at intervals not to exceed 30 feet (9.1 m).

11.1.16 Wheels or casters shall be properly designed for strength and dimensions to support four (4) times the design working load.

11.1.17 All scaffold casters shall be provided with a positive wheel and/or swivel lock to prevent movement. At least 2 of the wheels on the ladder stand shall be of the swivel type.

11.1.18 Where leveling of the elevated work platform is required, screw jacks or other suitable means for adjusting the height shall be provided in the base section of each mobile unit.

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11.2 Mobile tubular welded frame scaffold

11.2.1 Units shall be designed to comply with the requirements noted in Section 11.1.

11.2.2 Scaffolds shall be properly braced by cross braces and/or diagonal braces for securing vertical members together laterally. The cross braces shall be of a length that will automatically square and align vertical members so the erected scaffold is always plumb, square and rigid.

11.2.3 Spacing of panels or frames shall be consistent with the loads imposed. The frames shall be placed one on top of the other with coupling or stacking pins to provide proper vertical alignment of the legs.

11.2.4 Where uplift may occur, panels shall be locked together vertically by pins or other equivalent means.

11.2.5 Only the manufacturer of a scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet (15.2 m) in height above the base unless such structure is approved in writing by a registered professional engineer or erected in accordance with instructions furnished by the manufacturer.

11.3 Mobile tubular welded sectional folding scaffolds

11.3.1 Units shall be designed to comply with the requirements noted in Section 11.1.

11.3.2 An integral stairway and work platform shall be incorporated into the structure of each sectional folding stairway scaffold.

11.3.3 An integral set of pivoting and hinged folding diagonal and horizontal braces and a detachable work platform shall be incorporated into the structure of each sectional folding ladder scaffold.

11.3.4 Sectional folding stairway scaffolds shall be designed as medium duty scaffolds except for high clearance. These special base sections shall be designed as light duty scaffolds. When upper sectional folding stairway scaffolds are used with a special high clearance base, the load capacity of the entire scaffold shall be reduced accordingly. The width of a sectional folding stairway scaffold shall not exceed 54 inches (1400 mm). The maximum length of a sectional folding stairway scaffold shall not exceed 6 feet (1800 mm).

11.3.5 Sectional folding ladder scaffolds shall be designed as light duty scaffolds including special base (open end) sections which are designed for high clearance. For certain special applications the 6 foot (1800 mm) folding ladder scaffolds, except for special high clearance base sections, shall be designed for use as medium duty scaffolds. The width of a sectional folding ladder scaffold shall not exceed 54 inches (1400 mm). The maximum length of a sectional folding ladder scaffold shall not exceed 6 feet 6 inches (2 m) for a 6 foot (1800 mm) long unit, 8 feet 6 inches (2.6 m) for an 8 foot (2.4 m) unit or 10 feet 6 inches (3.2 m) for a ten-foot (3 m) long unit.

11.3.6 The end frames of sectional ladder and stairway scaffolds shall be designed so that the horizontal bearers provide supports for multiple planking levels.

11.3.7 Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet (15.2 m) in height above the base, unless such structure is approved in writing by a registered professional engineer, or erected in accordance with instructions furnished by the manufacturer.

11.4 Mobile tube and coupler scaffolds

11.4.1 Units shall be designed to comply with the requirements noted in Section 11.1.

11.4.2 The material used for the couplers shall be of a structural type such as a drop-forged steel, malleable iron or structural grade aluminum. The use of gray cast iron is prohibited.

11.4.3 Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet (15.2m) in height above the base unless such structure is approved in writing by a registered professional engineer or erected in accordance with instructions furnished by the manufacturer.

11.5 Mobile work platforms

11.5.1 Units shall be designed to comply with the requirements noted in Section 11.1.

11.5.2 The minimum width of the base of mobile work platforms shall not be less than 20 inches (508 mm).

11.5.3 Adequate rigid diagonal bracing to vertical members shall be provided.

11.6 Mobile ladder stands

11.6.1 Units shall be designed to comply with the requirements noted in Section 11.1.

11.6.2 The minimum base width shall conform to Section 11.1. The maximum length of the base section shall be the total length of combined steps and top assembly, measured horizontally, plus 5/8 inch (16 mm) per step of rise.

11.6.3 Steps shall be uniformly spaced and sloped with a rise of not less than nine (9) inches (229 mm) nor more than ten (10) inches (254 mm) and a depth of not less than seven (7)

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inches (178 mm). The slope of the steps section shall be a minimum of fifty-five (55) degrees and a maximum of sixty (60) degrees measured from the horizontal.

11.6.4 Units having more than five (5) steps or 60 inches (1500 mm) vertical height to the top step shall be equipped with handrails.

11.6.5 Handrails shall be a minimum of 29 inches (737mm) high. Measurements shall be taken vertically from the center of the step.

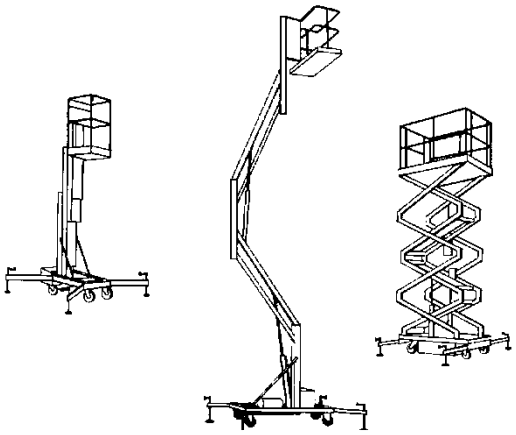
11.6.6 The load shall be applied uniformly to a 3 1/2 inches (89 mm) wide area front to back at the center of the width span with a safety factor of four (4).

11.7 Aerial Mobile Platforms

11.7.1 Vehicle-Mounted Elevating and Rotating Aerial Devices shall comply with SIA A92-2

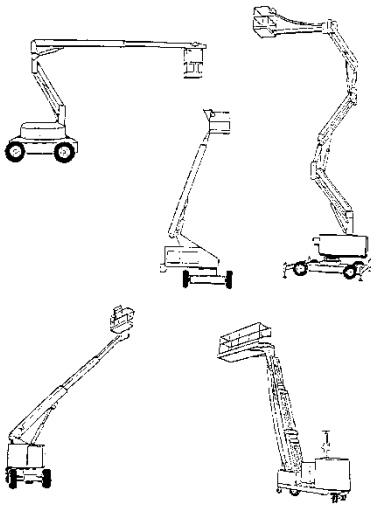
11.7.2 Manually Propelled Elevating Aerial Platforms shall comply with SIA A92.3

Figt. B-6 Mobile Work Platforms



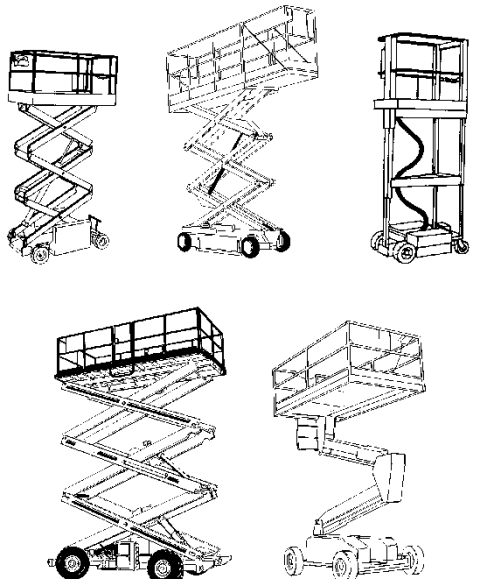
11.7.3 Boom-Supported Elevating Work Platforms shall comply with SIA A92.5

Fig. B-7 Boom Supported Elevating Work Platforms



11.7.4 Self-Propelled Elevating Work Platforms shall comply with SIA A92.6

Fig. B-8 Self-Propelled Elevating Work Platforms



12.1 Manual Swinging Scaffolds

12.1 Specifications

12.1.1 Swinging scaffolds and their components shall be capable of supporting without failure at least 4 times the total suspended load for which they are intended.

12.1.2 Manual swinging scaffolds shall not be less than 20 inches (508 mm) or more than 30 inches (762 mm) wide. Hangers or stirrups shall be of a width to fit the platform. The platform shall be securely fastened to the hangers by U-bolts passed around the hangers and bolted up tightly or by other equivalent means. Stirrups or hangers shall be of mild steel or material of equivalent strength and shall be placed between 6 inches (152 mm) and 18 inches (457 mm) from the end of the stringers. Each hanger shall be provided with an eye to receive the tackle hooks and be provided with a means to receive a guardrail, a midrail and a toeboard. Center irons or other supports shall be provided to support the guardrail, the midrail and the toeboard at intervals of not more than 8 feet (2.4 m).

12.1.3 Guardrails and toeboards shall be provided at the outside of every manual scaffold. The guardrail shall not be less than 42 inches (1067 mm) or more than 45 inches (1143 mm) above the platform with a midrail between the guardrail and the work platform. A toeboard not less than 3.5 inches (89 mm) shall be provided on the outer edge of the platform.

12.1.4 Suspension ropes shall be made from galvanized or stainless steel wire or of synthetic fibers and shall be of one continuous length. Suspension rope attachments shall be a thimble-and-eye splices, ferrules or means which have been

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proven to provide equivalent strength. No wire rope shall be bent on a radius of less than eight times its diameter and no fiber rope shall be bent on a radius of less than two times its diameter except when passing through a positioning device that is in conformance with this Standard. All ropes shall be protected from contact with any surface that may abrade, sever or produce heat or extreme cold that could damage it. Wire ropes shall not be used as a conduit for electricity including a welding ground.

12.1.5 Fiber ropes shall:
a) be inspected, used and stored in accordance with the requirements of this Standard;
b) have a minimum breaking strength of 5400 pounds (2450 kg) or a twenty to one safety factor, whichever is greater, at all times during its usage;
c) be the correct diameter for the blocks being used.

12.1.6 Steel ropes shall:
a) be inspected, used and stored in accordance with the requirements of this Standard;
b) have a minimum tensile strength of 8800 pounds (3993 kg) or a ten to one safety factor, whichever is greater.

12.1.7 Blocks shall be compatible with the suspension rope and shall have a minimum pulley or sheave diameter of four times the rope's diameter.

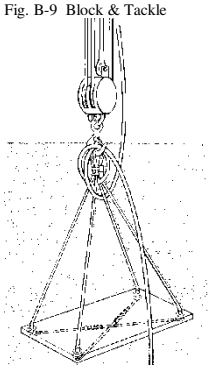
12.1.8 Where a manual hoist is used, it shall be of an accepted design and shall be provided with a secondary brake complying with the UL 1323 Standard. If a block and tackle hoist is used, it shall be a unit which automatically maintains an elevation when the force to raise or lower the unit is not applied. There shall be no creep. Tackle components shall have a minimum rated strength of 5000 pounds (2268 kg). Tying of knots, half hitches, bends, etc., shall not be allowed in any block and tackle suspension device to maintain an elevation.

12.1.9 Steel ropes shall only be used with a hoisting drum. Drum hoists shall be of an accepted design and a pawl shall be provided to engage a ratchet on the winding drum completely. In addition to the pawl, there shall be provided a secondary locking device to hold the platform at any level. A positive crank force is required to lower the hoist. Where a hoist other than a drum hoist is used, it shall be of an accepted design and provided with a secondary brake.

13 Boatswain's Chair

13.1 Specifications

Fig. B-9 Block & Tackle



13.1.1 Each chair shall be suspended from its four corners by means of rope slings. It shall have a soft wood seat 24 inches (610 mm) long and approximately 11 inches (280 mm) wide by 1 1/2 inches (38.4 mm) thick. If made of hard wood, oak or ash, it may be 1 1/8 inches (28.6 mm) thick. Any finish or covering on the wood product shall be transparent.

13.1.2 The seat may be constructed of material other than wood provided the material is equivalent in strength to 1 1/2 inches (38.4 mm) soft wood or 1 1/8 inches (28.4 mm) oak or ash. If constructed of material of equivalent strength, cleats across the full width of the seat shall be provided unless analysis indicates they are not necessary.

13.1.3 A rope or "strapguard" shall be provided across the front and rear 18 inches (457 mm) above the seat.

13.1.4 Other designs and constructions may be substituted if they can be demonstrated to provide equal safety and strength.

13.2 Roof Anchorages

13.2.1 When manual swinging scaffold and boatswain’s chairs are used for window cleaning, building owners shall provide anchorages conforming to Sections 9 and 17 of this Standard. All anchorages shall be designed, installed and located under the supervision of a registered professional engineer. Window cleaners are not permitted to use anchorages for any other purpose than the one identified in the plan of maintenance for the building. Stringing rope between anchorages shall be in accordance with Sections 9 and 17.1.4 and included in the work plan as described in Section 1.7.

13.2.2 An anchorage used for a personal fall arrest system shall be independent from the anchorage used for the suspension system. Fall arrest anchorages shall be provided by the building owner and comply with Sections 9 and 17 of this Standard.

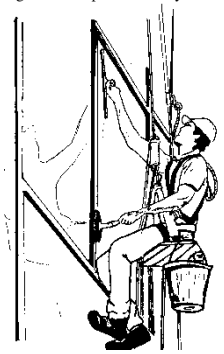
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14 Rope Descent Systems (RDS)

14.1 Specifications

14.1.1 Rope descent systems may be used as a substitute to the means and methods originally designed into the building or structure to perform window cleaning only when the design of the building or structure will safely support the use of the system in accordance with Section 7.2.6, and the components of the support system comply with Section 9 and 16 of this Standard.

Fig. B-10 Rope Descent System



14.1.2 The components of a RDS shall include:
a) suspension devices;
b) certified roof anchorage(s);
c) primary support rope(s) or line(s);
d) the descent device;
e) carabiner(s) or shackle(s);
f) a seatboard.

14.1.3 Individual components of a RDS without specific instructions for their use shall be prohibited.

14.1.4 All components of a RDS shall be compatible and each component, except the seatboard, shall have a minimum rated strength of 5000 pounds (2268 kg).

14.1.5 Descent Device: The system's descent device controls the downward movement of the operator, deriving its control capability by frictional forces developed when line(s) pass over and/or around and/or through fixed members of the descent device. When in use, descent devices shall maintain a given elevation under load when a positive action is applied.

Fig. B-11 Descent Device (Rack)



14.1.6 Descent devices whose design and manufacturer do not specifically include window cleaning activity shall be prohibited for use during window cleaning.

14.2 Design and Testing

14.2.1 Descent devices shall apply a loaded frictional force to the line(s) by wraps, turns or direct pressure to compensate for the static loads and dynamic loads applied by the user.

14.2.2 Manufacturers providing descent devices for window cleaning shall proof load test 100% of all such devices at a static load of 3600 pounds (1633 kg) without visual evidence of cracking, breaking or permanent deformation.

14.3 Seatboards

14.3.1 Seatboards shall be:
a) made of wood or other suitable materials;
b) reinforced with a metal strap or cleat;
c) capable of supporting a live load of at least 300 pounds (136 kg);
d) at least 24 inches (610 mm) long and approximately 11 inches (280 mm) wide by 1 1/8 inches (28.6mm) thick (for wood seats of oak or ash). Any finish or covering on the wood product shall be transparent. All rope and webbing used in suspending the seatboard shall be of synthetic fiber, preferably nylon or polyester, that has a rated minimum strength of 5000 pounds (2268 kg).

14.3.2 Water buckets shall be securely attached to the seatboard in such a manner that the buckets will not fall.

14.4 Carabiners

14.4.1 All carabiners used in a rope descent system shall be of manual or auto-locking design.

14.4.2 Carabiners shall not be used for any purpose other than connecting hardware or attaching descent and lifelines to anchorages.

14.5 Static Lines and Rope

14.5.1 Specifications
(a) All ropes shall be no less than $7/16^{th}$ inch (11 mm) in diameter and shall maintain a minimum strength of 5000 pounds (2268 kg) if knots are used to attach the rope to a roof support or anchorage.
(b) Ropes that have formed eyes for end attachment shall have a minimum strength of 5000 pounds (2268 kg)
(c) The working line(s) shall be the proper size to pass over and/or around the fixed members of the descent device body as recommended by the device manufacturer.
(d) Solid braided rope shall have no less than 20 carrier construction.
(e) When double braided kernmantle rope is used, it shall be static.

14.5.2 No rope used in a rope descent system shall stretch further than 10 per cent of its manufactured length when a live load is applied.

14.5.3 Ropes made entirely of polypropylene are prohibited.

14.5.4 Ropes shall be permanently marked or tagged with: length and diameter, date of manufacture and date placed in service.

14.5.5 All ropes shall be protected from contact with any surface that may abrade, sever, weaken or damage it.

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14.5.6 Ropes shall be inspected according to Section 5.7.16 and a means shall be provided by the employer to identify the use of descent lines and lifelines.

14.5.7 Rope shall be removed from service as recommended by the manufacturer or if one of the following conditions is evident or occurs:
a) braids are cut;
b) excessive abrasion has worn fibers;
c) there is hardness or stiffness;
d) dirt or grit has clogged fibers;
e) rust, tar or grease is present;
f) line size has been reduced;
g) subjected to a shock load;
h) exposure to chemicals that affect their strength;
i) exposure to excessive ultra violet degradation;
j) working lines that have been subjected to a rapid descent by an employee.

14.6 Roof Anchorages

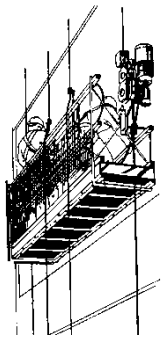
14.6.1 When a rope descent system is used for window cleaning, building owners shall provide anchorages conforming to Sections 9 and 17 of this Standard. All anchorages shall be designed, installed and located under the supervision of a registered professional engineer. Window cleaners are not permitted to use anchorages for any other purpose than the one identified in the plan of maintenance for the building. Stringing wire rope between anchorages shall be in accordance with Sections 9 and 17.1.4 and the engineered design included in the work plan in accordance with Section 1.7.

14.6.2 The anchorages used for personal fall arrest systems shall be independent of anchorages used for the suspension system. Fall arrest anchorages shall be provided by the building owner and comply with Sections 9 and 17 of this Standard.

15 Transportable Suspended Powered Platforms (single and multiple suspension)

15.1 Specifications

Fig. B-12 Transportable Suspended Power Platform



15.1.1 Transportable powered scaffolding, including powered platforms, powered single or double manned cages and powered boatswain's chairs shall be designed by or under the direction of a registered professional engineer, and where applicable, shall be successfully tested in accordance with UL 1323 prior to their placement into service.

15.1.2 The scaffold's structural and mechanical components shall be fabricated from materials that will withstand anticipated conditions including dynamic forces and extremes. With the exception of powered boatswain's chairs, platforms shall be a minimum of 20 inches (508 mm) wide. When the suspension points on a multiple support scaffold are not at the unit's ends, the unit shall be designed to be continuously stable with a factor of 1-1/2 to 1 against upsetting under all conditions of use.

15.1.3 The design requirements for all scaffold components, excluding wire rope, shall be based on the limitations (stress, deflections, etc.) established by nationally recognized standards. The deflections of all structural components and connections shall be limited so as to not adversely affect the safe operation of any portion of the equipment.

15.1.4 Wire rope shall be designed and constructed in accordance with section 15.9. The scaffolding's powered hoist motor(s) shall comply with ASME A120.1, paragraph 3.6, “Hoisting Machines" and shall be listed (rated) in accordance with UL 1323, Scaffold Hoists.

15.2 Fall Protection

15.2.1 Occupants of powered platforms shall have means to prevent them from falling more than 6 feet (1800 mm) in the event one or more suspension point fails. When operating a platform suspended from a single point system with two wire rope support, means shall be provided for an independent vertical lifeline attached to a certified anchorage on the roof unless:
a) provisions are made, complying with a through d, below;
b) an overhead obstruction exists as stated in Section 15.2.2 c).

15.2.2 When operating a platform suspended from a two point system with two wire rope support, means shall be provided for an independent vertical lifeline attached to a certified anchorage on the roof. When operating a platform suspended from a two point system with four wire rope support, means shall be provided for an independent vertical lifeline attached to a certified anchorage on the roof or to an engineered horizontal lifeline (dog line) structurally affixed to the work platform providing all of the following conditions are met:
a) the back-up support wire rope at each end of the platform is attached to an independent anchorage rope, which in turn is secured to a roof mounted fixture independent of the platform's primary support system;
b) the anchorage wire rope has been designed by a registered professional engineer to support one end of the laden platform should the platform lose its support. All applicable dynamic loads shall be considered when designing the anchorage rope;
c) if one end of the platform loses its support, the anchorage rope shall prohibit that end of the platform from falling more than two feet before the anchorage rope's securing device engages;

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d) a securing device shall engage the platform's secondary wire rope without severing the secondary rope in the above accident condition; and
e) the dog line on the back of the platform is positioned at a minimum of 2 feet (600 mm) above the deck, is designed by a registered professional engineer and is anchored to a structural element of the platform. Additionally, double acting rope grabs (or other device that prohibits the unintentional travel in either direction) shall be used as the engaging device between the operator's lanyard and the dog line unless the dog line has been segmented with securing eyes on the back hand rail that prohibit the operator from sliding more than 4 feet in the event the platform falls to a vertical position. Lanyards attached to doglines shall not exceed 48 inches (1200 mm) in length.

15.2.3 Single point and multiple point suspended working platforms containing an overhead structure which restricts the egress of the employees shall incorporate a direct tie off point (or a horizontal lifeline) for the occupant's personal fall arrest system and shall incorporate all provisions established in Section 15.2.2. (a) through (e).

15.3 Scaffolding Connections

15.3.1 Bolted connections shall be of a secured type, i.e, each bolt and/or nut shall be either self-locking or shall be secured by other means to prevent loosening by vibration.

15.3.2 For domestically manufactured equipment, when welding is employed for structural connections, the welding shall be in strict conformance with AWS standards. For foreign manufactured equipment, when welding is employed for structural connections, the registered professional engineer shall ascertain that weld designs employ weld configurations, materials, sizes, and processes that are listed by the AWS.

15.3.3 Foreign materials are acceptable for welding when subjected to criteria applying ASTM designated materials with equivalent properties for strength and welding. In addition, the registered professional engineer shall secure written proofs from the manufacturer that welders have been tested and found qualified and that quality control measures have been employed, satisfying the intent of AWS standards.

15.3.4 All structural welds shall be visually inspected for compliance with design requirements and shall be subjected to nondestructive testing. Inspection and test records shall be maintained by the equipment manufacturer for domestically manufactured scaffolds and by the registered professional engineer for foreign manufactured scaffolds.

15.4 Enclosures for Powered Platforms and Cages

15.4.1 Suspended working platforms shall be provided with a guardrail system on all sides. Guardrails at the extreme ends of a multiple support platform may be excluded if:

a) the platform's hoist motors are positioned 18 inches (457 mm) or less as measured from the end of the plank to the centerline of the hoist;
b) the distance between the hoist motor's housing and inside face of the side guardrails is less than 12 inches (305 mm).

15.4.2 The system shall consist of a 42 inch (1067 mm) high enclosure on the outboard side. The inboard side shall not be less than 36 inches (914 mm) high. The enclosure shall consist of a top guardrail, a mid-rail and a 4 inch (102 mm) high toeboard. All connections used in fabricating the guardrail system shall be of the positive type. Set screws and friction connections are prohibited.

15.5 Platform Flooring

15.5.1 The flooring shall be of a slip-resistant type and shall contain no opening that would allow the passage of a 1 inch (25.4 mm) diameter ball. If larger openings are provided, they shall be protected by placing a screen under the opening. The screen shall have holes less than 1 inch (25.4 mm) in diameter.

15.6 Building Contact Provisions

15.6.1 All suspended units shall be provided with face rollers to prevent the unit from abrading the face of the building when there is a possibility of the unit contacting the face. When constructed with guide rollers, guide shoes or building face rollers, they shall be designed to compensate for normal variations in building dimensions and to permit horizontal leveling of the suspended unit.

15.7 Electrical Wiring and Components

15.7.1 Electrical wiring and components shall conform to the requirements of the standards adopted by the National Fire Protection Association (National Electrical Code) or the JIC Electric Standards for General Purpose Machine Tools. Suspended equipment shall be grounded by a grounding conductor in the cable used to carry power between the suspended equipment and the building's power outlet receptacle. Electric cord yokes that splits the power supply to multiple electric hoists are permitted and the cords that extend from the yoke to the hoists need not be strung through electrical conduit provided the cords are adequately insulated and shielded from the elements. All electrical controls shall be housed in weather proof enclosures.

15.8 Load Rating Identification

15.8.1 Each suspended unit shall be provided with a load-rating plate, conspicuously located, stating the weight of the unit and live load rating of the suspended unit. The load-rating plate shall be of a non-corrosive, permanent-type, compatible material and securely fastened to the unit. All letters and figures on the plate shall be made by printing, stamping or etching, or shall be cast on the surface of the

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plate. The letters and figures shall not be less than 1/4 inches (6.4 mm), with the load indicated in 1/2 inches (13 mm) high figures. The letters and figures shall be maintained in legible condition.

15.9 Suspension Wire Ropes

15.9.1 All suspension ropes shall be sized to conform with the required factor of safety, but in no case shall the size be less the 5/16 inches (8 mm) in diameter.

NOTE: Traction hoist manufacturers have specific wire rope construction requirements to minimize bird-caging.

15.9.2 The rope's minimum design factor of safety shall be 6 and shall be calculated by the following formula:
F = SN/W where: N= number of suspension ropes under load, S= manufacturer's catalog strength of one suspension rope, W= maximum static load at any point of travel.

15.10 Rope Tags

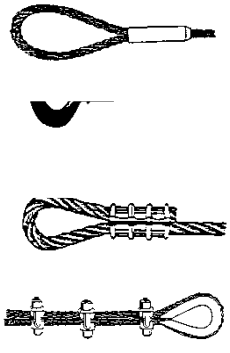
15.10.1 All wire rope shall have a tag bearing the following data:
a) diameter;
b) grade and construction;
c) length;
d) date of purchase.

15.11 Wire Rope Connections

15.11.1 The specification for suspension wire ropes and hoist drum connections as put forth by the powered hoist manufacturer shall be utilized for each hoist's wire rope on transportable platforms. Wire ropes, at their point of suspension, shall be formed in an eye with a thimble protector and the rope shall be fastened in such a manner that all portions of the rope shall be readily visible, except for babbitted socket connectors. Fastenings shall be of the type and size capable of developing not less than 80 % of the rope's manufacturer's rated catalog strength and shall be one of the following:

a) individual tapered babbitted sockets;

Fig. B-13 Wire Rope Connections



b) zinc fastenings for wire rope 5/16 inches (8 mm) diameter and larger;

c) swaged fittings;

d) forged "'J" type rope clips, installed by a qualified person;

e) other types of fastenings substantiated by tensile and fastening tests conducted by a qualified laboratory.

15.12 Wire Rope Lubricants

15.12.1 The wire rope and fiber core shall be lubricated at the time of manufacture. The lubrication on traction hoisting ropes shall be suitable for such service.

15.12.2 **CAUTION:** Surface applied lubricants such as graphite and similar products may create severe slipping of wire rope through traction hoists and shall not be used unless the lubricant is specifically specified by the hoist's manufacturer for use on the hoist's wire rope.

15.13 Platform Tail lines

15.13.1 The primary rope's tail line and/or the secondary wire rope's tail line may suspend below the powered platform, cage or chair if the tail line(s) is(are) secured so as to prevent lateral displacement and be protected from contact by surface traffic.

15.14 Suspension and Wind Sway Protection

15.14.1 Buildings with service drops exceeding 130 feet (40 m) in height shall provide a wind sway protection system, consisting of either continuous mullion track guides, intermittent stabilization, work station stabilization or angulated roping. When only work station or angulated roping stabilization is possible, descents shall not exceed 300 feet (91 m).

15.14.2 Wind sway protection systems shall provide the greater of:
a) 600 pounds (270 kg) of resistance (includes a 4 to 1 safety factor in any outward direction);
b) shall be designed for an operating wind of 25 mph and a design wind of 50 mph to be applied to the units full sail area.

15.14.3 Standing lines are specifically prohibited for use as wind sway protection unless there is no other system of stabilization that could be practically and safely employed. If there is no other alternative to a standing line system then it is to be designed by or under the direction of a registered professional engineer and permanently dedicated to the building.

15.14.5 Window cleaner’s belt anchors re-classified and used as intermittent stabilization anchorages are permissible under the following guidelines:
a) the anchors are successfully re-tested per Section 10.2.4;
b) tie-in lanyards have terminals that mate to the existing anchors;
c) existing anchors not used for wind stabilization are removed or beheaded;
d) the building’s windows have either been permanently sealed or replaced with fixed windows.

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15.15 Ground Rigged Platforms

15.15.1 Ground rigged scaffolding may be suspended from roof support equipment (complying with Section 17), providing the height of suspension does not exceed 300 feet (91m) unless continuous engagement is employed to provide wind sway protection.

15.15.2 Where suspension heights exceed 130 feet (40 m) and where rigging must be suspended by hand, mechanical means shall be provided for raising and lowering lines (wire rope, fiber and cable) when the entire line's weight exceeds 55 pounds (25kg).

15.16 Single Point Suspended Working Platforms

15.16.1 In addition to complying with all applicable provisions of Section 15, powered, single point suspended working platforms shall be equipped with a secondary wire rope separate from the suspension rope which will prohibit the work platform from falling should there be a failure of the primary means of support. Except for powered cages with an overhead obstruction, the operator shall be either secured to the work platform by a full body harness and lanyard or to an independent vertical lifeline.

15.17 Powered Boatswain's Chairs

15.17.1 In addition to complying with all applicable provisions of Section 15, powered boatswain's chairs shall be equipped with:
a) a secondary wire rope separate from the suspension rope which will prohibit the working platform from falling should there be a failure of the primary means of support;
b) a seat of molded or stamped design with a curved backrest (tractor type seat) and seatbelt;
c) powered hoist with a secondary suspension rope attachment and which is listed (rated) in accordance with UL 1323;
d) provisions for safely storing and securing tools;
e) provisions for securing a water bucket;
f) foot stirrups to allow the occupant to rest his/her feet; and
g) building face rollers located to prevent contact between the occupant and the building.

15.17.2 The operator shall either secure his/her safety harness and lanyard to a designed anchorage on the chair or use an independent vertical lifeline.

16 Retrofit Of New, Power Operated Systems Dedicated To The Building

16.1 New powered operated equipment and its supporting structures dedicated to and retrofitted on an existing building shall comply with the following provisions.

16.1.1 Structural supports, davits, sockets, outriggers, tie-downs, tie-in guides, anchoring devices and any affected parts of the building included in the installation shall be designed by or under the direction of a registered professional engineer experienced in such design. The affected parts of the building shall be designed so as to allow the equipment to be used without exposing employees to a hazardous condition.

16.2 Design of The Installation

16.2.1 All aspects of the installation shall be designed be in accordance with ASME A120.1.

16.2.2 Transportable and portable equipment shall not be craned from one building level to another.

16.2.3 Mechanical means shall be provided for raising and lowering lines (wire rope, fiber and cable) when the entire line's weight exceeds 55 pounds (25 kg).

16.3 Climatic Conditions and Wind Sway Protection

16.3.1 Exterior installations shall be capable of withstanding prevailing climatic conditions. Service drop heights that exceed 130 feet (40 m) shall be equipped with a wind sway protection system consisting of either intermittent stabilization, continuous button guides or continuous mullion track guides. Service drop heights of 130 feet (40 m) or less shall employ one of the above mentioned means of wind sway protection or shall utilize angulated roping, provided an angulation force of at least 10 pounds (4.5 kg) is maintained under all conditions of loading.

16.3.2 The use of existing window cleaners anchors, re-classified as intermittent stabilization anchorages, may be used when designed and tested in accordance with Section 8.1.4. Window cleaner’s belt anchors not used as intermittent stabilization tie-ins shall be "disarmed" or removed from the window unless the building has been classified as a Historic Building, in which case other provisions shall be used to prevent the window cleaner’s belt anchors from future use. Standing lines used for sway protection shall comply with Section 15.14 of this Standard.

16.3.3 Electric cable and separate hanging lifelines shall be stabilized against displacement by the wind at vertical intervals not exceeding 200 feet (61m). The means of stabilization may be independent of the building face being cleaned.

16.4 Electrical Provisions on the Building

16.4.1 Electrical outlets shall provide electrical service on a common dedicated circuit that matches the electrical power requirements of the equipment's operation and service including its peak amps, volts and phase. At least one outlet shall be provided for each building level from which the

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equipment is supported. Additional outlets shall be provided on large roof areas and spaced a maximum of 200 feet (61m) between outlets. Each outlet shall have a cord anchorage and the plug end of the cord shall have a strain relief device which can be secured to the receptacle's anchorage.

16.4.2 The electrical design of the power supply shall be in accordance with (a) through (f).
(a) Building wire sizes shall be of such capacity that not more than a 3% voltage drop from nominal equipment requirements shall occur at each building outlet when full load is applied to the circuit.
(b) Each power or communication outlet shall be provided with an adjacent strain relief anchorage to prevent force being applied to the outlet or to the conduit leading to the outlet by movement of the equipment. All outlets (receptacles) shall be of the twist lock type.
(c) The equipment power supply should be from an independent electrical circuit that will remain separate from all other equipment within or on the building. If the building is provided with an emergency power system, the equipment circuit may be designed so that it is connected to the emergency circuit.
(d) The power circuit shall be provided with a cut-off switch that can be locked in the ON or OFF position. The switch shall be conveniently located with respect to the primary operating area of the equipment to allow the operators of the equipment access to the switch.
(e) Power and communication outlets shall be located at the approximate elevation of the primary equipment operating area.
(f) The power circuit shall contain a separate equipment ground conductor that shall be connected to an earth ground.

16.5 Hosebibbs

16.5.1 A supply of water should be provided at each level from which the platform is rigged.

16.6 Lightning Rods

16.6.1 All lightning rods located in areas to be traversed by scaffolding shall be of the spring loaded, tipover variety. Rigid lightning rods shall not be used in such areas of the work. Lightning rod tips shall be secured to the lightning rod base with a wire rope lanyard to the tip so the tip is retained if it were separated from its spring mounting.

17 Roof Support Equipment

17.1 Parapets, Cornices and Building Anchorages

17.1.1 Building anchorages used to tie back or directly support suspended platforms shall comply with all applicable provisions of Section 9.

17.1.2 Parapets and guardrails which may be subjected to additional loading such as lifelines, power cables, etc., shall be designed to consider these added loads.

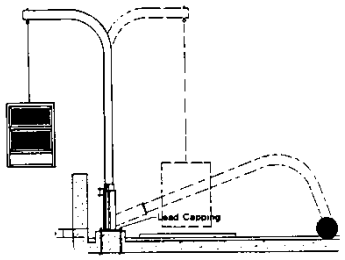
17.1.3 A roof parapet may be used to directly support the suspended platform (as is the case with parapet clamps or when supporting the fulcrum of an outrigger beam) and may be used as a tie back anchorage providing:
a) the fixture directly attached to the parapet (parapet clamp, eye bolt, etc.) has been designed by or under the direction of a registered professional engineer for the specific intended load application with a minimum factor of safety of 4 to 1;
b) the load supporting parapet has been structurally verified by a registered professional engineer as to its capacity to hold the intended load with a factor of safety of not less than 4 to 1;
c) parapets used as a tie-back anchorage shall be located directly behind the apparatus being tied back;
d) parapet clamps, if used as tie-back anchorages shall be specifically designed for that load application and so certified by its manufacturer. The parapet clamp/ tie-back anchorage shall be positioned directly behind the apparatus being tied back.

17.1.4 Horizontal lines constructed of wire rope are permissible for use as a tie-back provided:
a) the line(s) is(are) permanently left in place;
b) they are attached to certified anchorages, excluding parapet clamps;
c) its wire rope and wire rope end attachments comply with Section.9.1.1;
d) the wire is inspected prior to each use in accordance with Section 9.1.9.

17.2 Davits and Davit Fixtures

17.2.1 Davits may be used to support window cleaning activities providing they are not used within 10 feet (3 m) of high-voltage lines and:
a) the davit is designed by a registered professional engineer;
b) the davit has a stability factor of at least 4 to 1 against overturning. Each davit shall be designed to support an ultimate load of not less than 4 times the rated load (based upon the rated load of the hoist when supporting a powered access platform);

Fig. B-14 Davit Arm, Socket and Base



c) the davit has a load rating plate permanently affixed to it stating the davits weight, the manufacturer’s name, date of manufacture and maximum allowable load and that the working load is not to be exceeded during its use;
d) the suspension rope(s) shall be attached to the davit with a safety hook or a screw pin shackle;

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e) the davit is not craned to the roof level where it is to be used;
f) the davit's butt or base fixture mates to the building's socket;
g) means are provided to lock the davit to its socket or base before it is used to suspend the platform;
h) the roof socket meets all requirements of Section 17.3;
i) the davit weighs less than 80 pounds (36.2 kg) or is equipped with wheels.

17.2.2 Portable davits shall not have an arm reach exceeding eight (8) foot, six (6) inches (2.6 m) measured from the primary rope support to the centerline of the davits' mast.

17.3 Sockets

17.3.1 Roof or parapet mounted sockets may be used to support portable davits providing:
a) the socket has a load rating plate and that load it not exceeded;
b) the socket allows for the davit to be tipped down for insertion of the davit butt into the socket and the angle of tip down shall not exceed a maximum of 15 degrees above the horizon;
c) if the direction of tip down is parallel to the parapet, provisions shall be provided so as to prohibit the davit from being accidentally dropped over the side of the building;
d) any parapet exceeding six feet in height, to which a socket is mounted, shall provide means for the:
1) safe access of personnel to rig the tip of the davit;
2) davit erection;
3) rotation of the davit arm as necessary for the specific application;
4) safe boarding of the suspended unit.

17.3.2 When portable sockets are used they shall:
a) be designed to be used with the davit and the roof fixture to which it mates;
b) be fitted with wheels to allow ready movement from pedestal to pedestal;
c) not require lifting to mate with the pedestal;
d) shall have a pedestal pin attachment connection or positive locking pin connection to the pedestal;
e) socket/pedestal connections requiring bolts or other threaded fasteners shall not be used.

17.4 Tie-backs

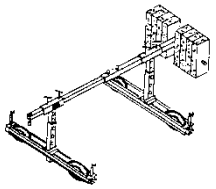
17.4.1 A davit whose structural design requires a supplementary tie-back is strictly prohibited unless the davit is non-rotating.

17.4.2 If a tie-back is used with a non-rotating davit, it shall be designed and constructed without a turnbuckle and designed such that the installer is not required to use a tool for its setup.

17.4.3 A non-rotating davit's design shall consider a 15 % side load (based upon the rated load of the hoist when supporting a powered access platform) applied at the end of its arm, creating lateral bending in the davit arm and torsioning its mast.

17.5 Counterweighted Outriggers

Fig. B-15 Transportable Counterweighted Outrigger



17.5.1 Transportable, counterweighted outriggers may be used to support ground rigged window cleaning activities and RDS, providing:
a) the outrigger is designed by a registered professional engineer;
b) the outrigger has a stability factor of four against overturning or upsetting of the outrigger. Each outrigger shall be designed to support an ultimate load of not less than 4 times the rated load (based upon the rated load of the hoist when supporting a powered access platform). The fulcrum point of the beam shall rest on leg(s) or equivalent supports securely attached to the beam and so arranged as to prevent lateral overturning of the beam. Each outrigger shall be designed for lateral stability to prevent rollover in the event an accidental lateral load is applied to the outrigger. The accidental lateral load to be considered in this design shall not be less than 15% of the rated load;
c) the inboard end of outrigger beams, measured from the fulcrum point to the anchorage point, shall be not less than 1 1/2 times the outboard end in length;
d) solid counterweights are secured to the inboard end of the outrigger;
e) the outrigger has a load rating plate permanently affixed to it and readily visible, bearing the following information in letters at least 1/4 inch (6.4 mm) in height:
1) the beam's rated load;
2) manufacturer's name;
3) precautionary warning message prohibiting use of the beam within 10 feet of high voltage lines;
f) the suspension rope(s) shall be attached to the outrigger with a safety hook or a screw pin shackle;
g) the outrigger is not craned to the roof level where it is to be used;
h) each outrigger shall be tied back to a certified anchorage on the building with a wire rope equivalent in strength to the suspension rope, but in no case less than 5/16 inch (8mm) in diameter. The tie-back rope shall be installed parallel to the center line (longitudinal axis) of the outrigger. All tie-down fittings at the inboard end of the beam shall be of a type that vibration effects shall not produce accidental disengagement. Safety hooks for beam tie-down shall not be used.
i) the outrigger shall be so located that the suspension wires for a two point suspended working platform are hung parallel and any portion of the outrigger or its counterweights weighing more than 80 pounds (36 kg) shall be equipped with a stable means for its transport (wheels or cart).

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17.5.2 Formula for Determining the Correct Amount of Counterweight Required for a Portable Outrigger Beam.



$$W = \frac{B \times C \times 4}{A}$$

W= Minimum weight of the counterweights

A= Distance inboard from fulcrum(front end of beam where it rests) to the point on the beam where the counterweights hang.

B= Distance outboard from the fulcrum point to the suspension point

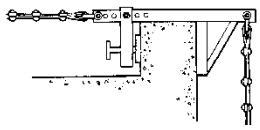
C= Load rating of the hoist

x 4= The requirement of a 4 to 1 safety factor against the hoist load

17.6 Parapet Clamps and Cornice Hooks

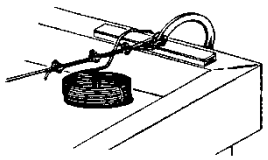
17.6.1 Parapet clamps or cornice hooks (hereafter referred to as "clamps/ hooks") may be used to support ground rigged, window cleaning activities providing:

Fig. B-16 Parapet Clamp



a) the clamp/hook is designed by a registered professional engineer and has a stability factor of 4 against overturning or against the causation of structural damage to its supporting parapet or cornice, respectively;
b) each clamp/hook and its supporting building structure shall be designed to support an ultimate load of not less than 4 times the rated load (based upon the rated load of the hoist when supporting a powered access platform). Additionally, each clamp/hook shall be designed for lateral stability to prevent rollover in the event an accidental lateral load is applied to the clamp/hook. The accidental lateral load to be considered in this design shall not be less than 15% of the rated load;
c) the clamp/hook has a load rating plate permanently affixed to it, stating its maximum allowable load and that working load is not exceeded during its use;

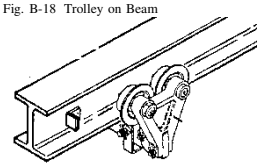
Fig. B-18 Cornice Hook



d) the suspension rope(s) shall be attached to the clamp/hook with a safety hook or a screw pin shackle;
e) the clamp/hook is not craned to the roof level where it is to be used;
f) each clamp/hook shall be tied back to a certified anchorage on the building with a wire rope equivalent in strength to the suspension rope but in no case less than 5/16 inch (8 mm) in diameter. The tie-back rope shall be installed parallel to the center line (longitudinal axis) of the clamp/hook.

17.7 Overhead Monorail Tracks and Trolleys

Fig. B-18 Trolley on Beam



17.7.1 Transportable trolleys may be used on overhead tracks permanently affixed to the building to support window cleaning activities providing:
a) the monorail tracks have end stops and the system is equipped with independent trolleys from which the operator's vertical lifeline is suspended;
b) the primary support trolley(s) and the safety line trolley(s) are designed by a registered professional engineer and has a stability factor of at least 4 to 1 against failure or against the causation of structural damage to its supporting track. Each trolley and its supporting track structure shall be designed to support an ultimate load of not less than 4 times the rated load (based upon the rated load of the hoist when supporting a powered access platform) plus the safety line load for each operator suspended from the track;
c) the trolley's wheel diameter and wheel gauge have been verified by a registered professional engineer for specific use on the monorail beam and the beam will safely support the loads applied;
d) the trolley system is designed in accordance with ASME A120.1;
e) the trolley and track are inspected and tested in strict accordance with Section 8 of this Standard.

17.7.2 Transportable monorail tracks suspended from davit arms, outriggers or portable support fixtures are prohibited.

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18. Referenced Standards and Documents

1. OSHA 29 CFR 1910.1200 Hazard Communication Awareness.
2. OSHA 29 CFR 1910.66 Powered Platforms for Building Maintenance.
3. ANSI-Z359 Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.
4. ASME A-120.1 Powered Platforms for Building Maintenance.
5. ANSI A 14.1-Safety Requirements for Portable Wood Ladders.
6. ANSI A 14.2-Safety Requirements for Portable Metal Ladders.
7. ANSI A 14.3-Safety Requirements for Reinforced Plastic Ladders.
8. SIA A92.2 Vechicle Mounted Elevating and Rotating Work Platforms.
9. SIA A92.3 Manually Propelled Elevating Work Platforms.
10. SIA A92.5 Boom Supported Elevated Work Platforms.
11. SIA A92.6 Self-Propelled Elevating Work Platforms.
12. UL-1323, Scaffold Hoists-Underwriters Laboratories.

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APPENDIX

These appendices are intended to be used only as a reference or guideline and are not to be considered a part of the IWCA I-14.1 Window Cleaning Safety Standard.

Appendix A- Standard Implementation

It is recognized that the parties who are affected by the content of this initial Standard will require a reasonable period of time to implement the methods, techniques and use of equipment described herein. As this Standard affects life safety, the following principle considerations should apply to its implementation:

a) window cleaning contractors and building owners and managers should review the contents of this Standard as to how it affects each. Contractors should be aware of the worker's requirements and building owners and managers should be aware of the site requirements. This mutual awareness should be developed within a year of the first publication of this Standard.

b) final implementation of the methods, techniques and equipment described herein should be accomplished in a period not to exceed 5 years from the date of the first publication of the Standard.

Appendix B- Training

Recommended elements for an effective training program:
a) pretest;
b) instructor qualifications;
c) classroom study;
d) examples of problems and actual job conditions;
e) on-the-job training period;
f) final evaluation;
g) continuing education for changes in codes and standards, new equipment and procedures;
h) refresher courses to ensure proficiency is maintained;
i) re-evaluation;
j) documentation.

Pretest

Does the individual have the basic knowledge and skills need to safely perform the tasks of window cleaning ?

Instructor Qualifications

The instructor should be trained in all aspects of the use of the equipment and the tasks that will be performed from it. --
-Does he/she have actual field experience?
-Is the instructor able, through training or gift, to teach to workers his/her knowledge and experience?
-Does the instructor have the time and accessibility to properly perform his/her duties?
-Can the instructor provide documentation, references, etc. to support the above?

Classroom Study

What are codes, standards and laws? Why are they written, who are they written by, why are they promulgated and how do they relate to each other?
-Federal and State Labor Codes (OSHA)
-How to read and interpret manufacturer's instructions.
-What equipment should be used?
-The safe use of equipment.
-Proper rigging techniques.
-Chemicals and tools available and when and how they should be used.
-Team –building exercises.
-First aid, including CPR.
-Attitude training relating to safety and work practices and worker and customer relationships.
-Drug, alcohol and other substance abuse and general health instruction.

Examples of Problems and Actual Job Conditions

-Simulation of actual conditions the student will encounter at the job site.
-Job site visits to acquaint the student of actual conditions.
-Hands on practical instruction and performance of techniques and methods learned in the classroom.

Evaluation

-Written test to ensure that instruction to date has been effective.
-Hands on experience test to ensure that instruction to date has been effective.
-Attitude evaluation to be sure that student will safely work with others.

On the Job Training Period

Work as a member of a crew under the guidance of a qualified and experienced team leader who is committed to assisting in the training of window cleaners. The work sites and equipment should be varied to provide the maximum exposure of the student-in-training to put into practice his/her classroom experience. During this period of training the worker should not be part of a two-person crew where the other crewmember could be at risk from an inexperienced coworker.

Work as a member of a crew at various job sites under the guidance of an experienced coworker. The work sites and equipment should be varied to provide the maximum exposure for the student-in-training to put into practice the skills and education that he/she has learned.

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Final Evaluation

-Written and oral tests to verify the education and practical experience.
-Evaluation from classroom instructor.
-Evaluation from crew leader(s) under whom the student received his/her on-the-job-training.

Continuing Education

-Semiannual safety seminars to reaffirm safe procedures.
-Immediate classroom and on-the-job training for any new or amended code, law or standard that would effect the worker or work site, any new piece of equipment put into service, new job site condition(s) or new job site(s).

Refresher Courses

-Annual retraining for procedures, equipment and first aide (CPR) instruction.

Evaluation

-Review and evaluation of the worker with regard to his/her knowledge, proficiency, work habits and attitude to all of the above.

Documentation

-In accordance with current Federal OSHA regulations, small businesses are required to document training of employees. -Verification documents should be used to signify when, where and how long employees were trained in the correct procedures on the use of chemicals and equipment they are expected to operate. Re-training and safety meetings should also be documented.

-Verification should include the signature of the trainer/educator, the signature of the student, the topic being taught, the date and place the training took place.

Appendix C- Anchor placement for working lines, lifelines and tie back lines

These recommendations are a guideline for the placement and installation of permanent anchorages on buildings where workers will be using suspended access equipment to perform window cleaning.

The IWCA I-14.1 Standard presently requires that working lines, lifelines and tie back lines be anchored either in line with the suspended worker or within 15 degrees of perpendicular.

New Construction

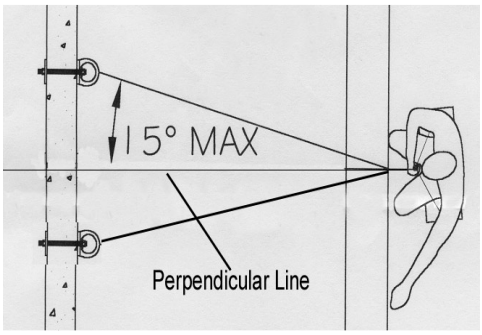
Newly contructed buildings compliance with the requirement of "in line" is easily done during the design phase of the building. Anchors should be placed in line to the work area so as to prevent displacement of lines under load and/or a fall greater than 6 feet (1800 mm). Placement of anchors shall not be within 6 feet (1800 mm) of the roof edge unless fall protection is provided to access those anchors safely. In no case should anchor spacing exceed 12 feet (3.6 m). In essence, the risk to the worker is greatly reduced by placing the anchors further back from the roof edge. (12 feet [3.6 m] to 50 feet [15.2 m])

Existing Buildings

The installation or identification of anchorages on existing buildings will vary from that of new buildings. Existing buildings can present obstacles that will prevent ideal anchor placement However, the safety of the worker(s) shall be of utmost importance when designing an anchor system to be installed on an existing building in compliance with Section 14.6.

Ideally, anchors are to be placed in line with the suspended worker(s). Where this is impracticable, anchors may be offset no more than 15 degrees from in line (perpendicular) provided displacement of the rope under load can be prevented. (see Fig. AP-1)

Fig. AP-1 Suggested Anchor Placement



As with new construction, placement of anchors shall not be within 6 feet (1800 mm) of the roof edge unless fall protection is provided to access those anchors safely. In no case should anchor spacing exceed 12 feet (3.6 m). As stated for new buildings, the risk to the worker(s) is greatly reduced by placing the anchors further back from the roof edge. (12 feet [3.6 m] to 50 feet [15.2 m]).

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