Designation: E2484 – 08 (Reapproved 2015)

Standard Specification for Multi-Story Building External Evacuation Controlled Descent Devices[1]

This standard is issued under the fixed designation E2484; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the requirements, performance, design, marking instructions, test methods and ancillary components of Multi-Story Building External Evacuation Controlled Descent Device (CDD) systems for emergency escape of persons who cannot use the standard exit facilities in multi-story buildings, defines requirements for their installation, periodic maintenance when installed and instructions for their use.

1.2 This specification does not apply to personal escape parachutes, rope, chain ladders or rappelling devices.

1.3 This specification does not apply to ancillary components used with and included in CDD systems, harnesses, connecting hardware, signage, special evacuation openings, personal protection equipment or devices and other components used on CDD systems which may be installed, purchased or used in accordance with the requirements specified herein.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B117 Practice for Operating Salt Spray (Fog) Apparatus

E488/E488M Test Methods for Strength of Anchors in Concrete Elements

E631 Terminology of Building Constructions

E894 Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings

E1512 Test Methods for Testing Bond Performance of Bonded Anchors

E2265 Terminology for Anchors and Fasteners in Concrete and Masonry

2.2 *ANSI Standards:*[3]

ANSI Z359.1 Fall Arrest System Components

ANSI/AWS D, 14.4 Specification for Welded Joints in machinery and Equipment

2.3 *ASCE Standard:*[4]

ASCE 1-05 Minimum Design Loads for Buildings and Other Structures

2.4 *ASME Standard:*[5]

ASME A120 Safety Requirements for Powered Platforms for Building Maintenance

2.5 *International Standards:*

CSA-Z259.10 Full Body Harness, M90[6]

CSA-Z259.2.3-99 Descent Control Devices[6]

EN 292-1:1991 Basic Design Concepts and general Principles of Design for Safety Machinery[7]

EN 362 Connectors and Attachment Hardware[7]

EN 1497 Rescue Equipment-Rescue Harness[7]

EN 1498 Rescue Equipment Class B-Rescue Harness[7]

EN 1891 Personal Protective Equipment[7]

PrEN 341:2002 Personal Protective Equipment for Protection Against Falls from Height[7]

2.6 *ISO Standards:*[8]

ISO 9002 Quality Management and Manufacturing Quality Assurance

[1] This specification is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.77 on High Rise Building External Evacuation Devices.

Current edition approved May 1, 2015. Published June 2015. Originally approved in 2006. Last previous edition approved in 2008 as E2484 - 08. DOI: 10.1520/E2484-08R15.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[4] Available from American Society of Civil Engineers (ASCE), 1801 Alexander Bell Dr., Reston, VA 20191, http://www.asce.org.

[5] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

[6] Available from Canadian Standards Association (CSA), 5060 Spectrum Way, Mississauga, ON L4W 5N6, Canada, http://www.csa.ca.

[7] Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, http://www.cen.eu.

[8] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, http://www.iso.org.

ISO 10333-5 Connectors and Attachment Hardware

2.7 *NEMA Standard:*[9]

NEMA 250 Enclosures for Electrical Equipment

2.8 *NFPA Standard:*[10]

NFPA 130 Appendix B 2.1.1 and B 2.1.2

2.9 *OSHA Document:*[11]

OSHA Safety and Health Bulletin, SHIB 02-24-2004 Suspension Trauma/Orthostatic Intolerance

2.10 *UL Standard:*[12]

UL 1523 Controlled Descent Devices for Marine Use, 9, 15, 16, 17 and 18

3. Terminology

3.1 See Terminology E631 for definitions of general concepts related to building construction.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *anchorage*—the physical weight bearing attachment of a CDD, rescue line or any part of a CDD system, to a building including the attachment of rails or tracks.

3.2.2 *controlled descent device, (CDD) system*—a system that lowers one or two people per descent, at a controlled rate of descent, with each person wearing a rescue harness, on the outside of a building, from an upper level to the ground or other safe location.

3.2.2.1 *automatic controlled descent device*—a CDD that provides automatic control of the rate of descent without any action required of the user.

3.2.2.2 *automatic controlled descent device, with manual override*—a CDD that provides automatic control of the rate of descent with a manual override capability which gives the user the ability to slow or stop the descent.

3.2.2.3 *controlled descent device (CDD)*—a device that is an integral part of all CDD systems, which controls the rate of descent.

3.2.3 *descent rail or track*—load bearing assemblies on which CDDs are mounted, inserted or attached and secured. Descent rails and tracks are components of CDD systems that are pre-installed on the outside of buildings and joined together in sections on which specially designed CDDs are supported during controlled descent.

3.2.4 *dynamic load*—the dynamic load that results from free-fall, expressed in Kilo Newton that must be supported by the CDD, rescue line, rail, track, connector, connection hardware, mounts and anchors.

3.2.5 *force limiter*—a mechanism that limits the force on the user, rescue line, rail or track and all in line, load bearing CDD system components and parts to a specific value during deceleration.

3.2.6 *free fall*—uncontrolled descent.

3.2.7 *hazard and safety assessment*—the process, involving hazard and safety evaluation, to determine that the safety and health hazards associated with the installation and use of a CDD system are acceptable.

3.2.8 *maximum rated height*—the highest elevation from which a specific CDD may be used.

3.2.9 *multiple rescue CDD system*—a CDD system capable of multiple rescues using multiple, one time rescue CDDs and a descent rail or track.

3.2.10 *one time rescue CDD*—a CDD system or CDD that is capable of only one rescue descent.

3.2.11 *rated load*—the weight of the person or persons being rescued including items worn or carried. The weights of system component parts that descend are not included in the rated load.

3.2.11.1 *maximum rated load*—the heaviest weight of the person or persons, being rescued, including items worn or carried that must result in a controlled descent, within the required rate of descent limits.

3.2.11.2 *minimum rated load*—the lightest weight of a person, including items worn or carried that must result in a controlled descent, within the required rate of descent limits.

3.2.12 *re-certification*—the process by which the manufacturer or their representative repairs or refurbishes CDD systems, and approves them for additional use.

3.2.13 *repetitive rescue CDD*—a CDD system or CDD that is capable of being returned to the site of descent initiation and used repetitively.

3.2.14 *rescue harness*—an adjustable human body holding device or harness assembly, which supports the pelvis and the torso.

3.2.14.1 *integral rescue harness*—a rescue harness is an integral part of a descending CDD system.

3.2.14.2 *separate rescue harness*—a rescue harness is a separate component of the CDD system that connects to a rescue line or the CDD.

3.2.15 *rescue line*—a flexible cable or rope that is used to support individuals during descent.

3.2.15.1 *anchored rescue line*—a rescue line that is anchored at the descent initiation location and is dispensed from or passes through a descending CDD.

3.2.15.2 *descending rescue line*—a rescue line that is dispensed from or passes through a CDD that is anchored at the descent initiation location.

3.2.16 *special evacuation opening*—a pre-installed special or modified window or door that can be opened to allow access to the outside of a building during an emergency.

3.2.17 *static load*—the specified steady state load, expressed in Kilo Newton that must be supported by the CDD, rescue line, rail, track, connector, connection hardware, mounts and anchors.

3.2.18 *suspended trauma syndrome*—a sometimes fatal condition caused by blood pooling when the legs are kept

[9] Available from National Electrical Manufacturers Association (NEMA), 1300 N. 17th St., Suite 1752, Rosslyn, VA 22209, http://www.nema.org.

[10] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, http://www.nfpa.org.

[11] Available from Occupational Safety and Health Administration (OSHA), 200 Constitution Ave., NW, Washington, DC 20210, http://www.osha.gov.

[12] Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, http://www.ul.com.

motionless in the vertical downward position during the period of suspension in some types of harnesses.

3.2.19 *total descent energy*—The total descent energy *W*, expressed in Joules is the energy that must be dissipated by a CDD during use. It is equal to the product of the descent load (*m*) multiplied by the acceleration of gravity, (*g*) times the height of the descent, (*h*) times the number of cycles, (*n*); $W = m \times g \times h \times n$

3.2.19.1 *Discussion*—Total descent energy manifests as heat energy that must be dissipated by CDD systems during use and is a critical parameter that must be accounted for in the thermal design of each system according to its Class and its maximum rated height.

4. Significance and Use

4.1 *Purpose*—This standard defines the design, materials, physical properties, operation and testing requirements for CDD systems, for use as a last resort for the external evacuation of people from multi-story buildings.

4.2 *Test Requirements*—The test requirements contained in Section 16 are for the purpose of design verification and certification, that CDD Systems comply with the requirements of this standard. Each manufacturer, in concert with the testing authority shall develop detailed test plans and procedures, based on the requirements of Section 16.

4.3 *Test and Inspection Documentation*—All tests and inspections shall be fully documented and retained by the testing authority and the manufacturer.

4.4 *Installation, Instruction and Periodic Maintenance*—This standard also defines requirements for the installation, instruction of those intending to use the CDDs and periodic maintenance of installed CDD systems.

4.5 *Hazard and Risk Analysis*—The standard also includes requirements for hazard and risk analysis.

5. CDD Classification

5.1 Type designates automatic control or automatic control with manual override capability and indicates whether or not a force limiter is employed.

5.2 Grade designates storage or permanent mounting of the CDD System or its components on the inside or outside of a building.

5.3 Class designates CDD Systems with one time rescue, repetitive rescue or multiple rescue capability, with the maximum rated load capability for one person or for two people per descent.

NOTE 1—The maximum rated height of a given CDD is a function of the specific Class of the CDD system, its total descent energy dissipation capability and the length of the rescue line, etc. The manufacturer shall define the maximum rated height for each of their specific CDD systems in compliance with the requirements of sections 8.7 through 8.7.10.

5.4 *Classification by Type*—Each CDD system and its CDDs shall be designed for use with rescue lines, with descent rails or with descent tracks. Type designates CDD systems with automatic descent control, automatic descent control with manual override capability and whether force limiters are or are not employed.

5.4.1 *Type I*—Automatic descent control CDD system.

5.4.2 *Type II*—Automatic descent control CDD system, which employ a force limiter.

5.4.3 *Type III*—Automatic descent control CDD system, with manual override capability.

5.4.4 *Type IV*—Automatic descent control CDD system, with manual override capability that employs a force limiter.

5.5 *Classification by Grade*—Classification by grade identifies CDD systems, CDDs, and component parts of CDD systems that are stored or installed inside or outside of buildings.

5.5.1 *Grade 1*—A CDD system designed for storage or installation outside of a building.

5.5.2 *Grade 2*—A CDD system designed for storage or installation inside of a building.

5.5.3 *Grade 3*—A CDD system designed for the storage or installation of some components or parts of the system on the inside and some stored or installed on the outside of a building.

5.6 *Classification by Class*—Classification by class defines CDD systems with anchored CDDs and descending rescue lines, anchored rescue lines with descending CDDs, repetitive or one-time rescue descent CDDs, one person or two person rescue capability, CDDs that are used on rails or tracks, and the maximum rated load.

NOTE 2—Classes I and J CDD systems shall be limited to the rated height of 35 m, reference sections 8.7.9 and 8.7.10.

6. Ordering Information

6.1 CDD systems may be purchased by individual apartment or high-rise Condo dwellers and families, multi-story

TABLE 1 CDD Systems by Class

Class	Anchored CDD		Anchored Rescue Line	Rails or Tracks	Repetitive Rescues	One Time Rescue	Number per Descent	Maximum Rated Load
A	X				X		1	135 kg
B	X				X		1 or 2	180 kg
C	X					X	1	135 kg
D	X					X	1 or 2	180 kg
E			X			X	1	135 kg
F			X			X	1 or 2	180 kg
G				X		X	1	135 kg
H				X		X	1 or 2	180 kg
I	X	or	X			X	1	135 kg
J	X	or	X			X	1 or 2	180 kg

building business tenants; for their employees and multi-story building owners or others requiring a last resort means of evacuation. These systems may be ordered by Type, Grade and Class, based on the requirements of the purchaser. The selection of CDD systems may be based on any combination of Type, Grade and Class, in order to achieve the required capability.

6.2 *Height of Use*—The height of intended use, based on the purchaser's requirements, must be specified for each CDD system and CDD purchased.

6.3 *Assistance*—The CDD system manufacturer or the manufacturer's representative shall provide assistance and guidance to the purchasers of CDD systems, in the selection process and shall assist with or perform the installation, of the system.

6.3.1 *Number and Location of CDD Systems*—The manufacturer shall evaluate the requirements of the purchaser regarding the number of people that must be evacuated, the location of those people within the building and then determine the number of CDD systems required and the installation location of each system.

6.3.2 *Special Requirements*—The manufacturer or their representative shall identify any special user needs, such as special rescue harnesses or accessories, and any unique conditions that must be accommodated. The manufacturer or their representative shall prescribe special rescue harnesses and accessories to the purchaser when necessary and assure that any unique conditions are considered in the installation.

6.3.3 *Instruction*—The manufacturer or his representative shall provide instruction to each purchaser in the proper use of the CDD system.

7. Materials and Manufacture

7.1 *Structural and Mechanical Components*—Structural and mechanical component parts of CDD systems shall be fabricated from structural materials that will withstand the required static and dynamic loads and other requirements of this standard, including environmental and climatic conditions. Verification shall be by analysis of the manufacturer's technical documentation and testing in accordance with Section 16.

7.2 *Durability and Shelf-Life*—Materials used in CDD Systems shall be selected to provide a minimum shelf-life and durability of 10 years, necessary to support storage and installation periods, inside or outside of buildings, based on their grade, (see 5.5.1 or 5.5.2), for a minimum of 10 years in any area of the world where multi-story buildings exist.

7.2.1 *Durability Verification Analysis*—The manufacturer shall perform a shelf life and durability analysis of their specific CDD system and establish periodic inspection, statistical or other testing and to determine the need for any required periodic inspection and maintenance that is necessary to assure a minimum of 10 years shelf life and durability.

7.2.2 *Inspection and Maintenance*—The manufacturer or their representative shall perform any required inspection and maintenance that is determined to be required after the CDD system has been installed.

7.3 *Connectors and Attachment Hardware*—Connectors and attachment hardware shall be selected by the manufacturer from products constructed and tested in accordance with the requirements of either CSA Z259.2.3-99, EN 362 or ISO 10333-5. Connectors and attachment hardware shall have automatic or manual locking gates. Verification shall be based on vendor certifications and by testing of the CDD in accordance with 16.1 Static Strength Test and 16.2 Dynamic Strength Test.

7.3.1 *CDD Attachments to Rails or Tracks*—The mechanisms that attach CDDs to rails or tracks shall be fail safe by design to include interlocks or other mechanisms that prevent separation of the CDD from the rail or track and separation of rail or track sections from each other. Provisions in the system design shall be included to prevent any possibility of dropping the CDD during the process of mounting, attachment or any other activity associated with preparing the CDD for descent. Verification shall be accomplished by testing in accordance with sections 16.1 and 16.2 and by inspection and analysis of the manufacturers design documentation and operating procedures.

7.4 *Surface Finish*—All surfaces shall be clean and free of scale, rust and deposits of foreign matter. Surfaces that come in contact with material that can be torn shall be free of burrs, pits, sharp edges and rough surfaces. Verification shall be by inspection.

7.5 *New Condition*—All component parts shall be new and in unused condition when incorporated into CDD assemblies when they are manufactured and initially put into service. Verification shall be by inspection and review of manufacturer's documents.

7.6 *Welding*—All structural welds shall be visually inspected over their entire lengths. Acceptance criteria of welds and repairs shall be in accordance with ANSI/AWS D, 14.4. Verification shall be by inspection and review of the manufacturer's quality assurance documents.

7.7 *Storage and Operating Temperature*—Materials used in CDD Systems shall be selected for compatibility with the requirement to provide reliable performance at ambient temperatures based on their Grade. Grade 1 CDD systems and those components of Grade 3 CDD systems, stored in locations outside of buildings, shall be capable of long term storage and shall be capable of the required performance at ambient temperatures ranging from –35°C to +60°C. Grade 2 CDD systems and those components of Grade 3 systems stored inside of occupied buildings shall be capable of long term storage at ambient temperatures common to the interior of occupied buildings and shall be capable of the required performance at ambient temperatures ranging from –20°C to +55°C. Verification shall be by testing in accordance with Section 16.

7.8 *Protection from Solar Radiation and Other Environmental Factors*—CDD systems and their component parts made of materials that may degrade due to exposure to sun light or other environmental factors shall be protected against such degradation by shielding or other means. Verification shall be in accordance with Section 14.

7.9 *Corrosion Prevention*—CDD Systems shall be designed to avoid corrosion and galvanic action that could reduce the strength or performance capability of any component. One or more of the following shall be included in the design to prevent galvanic action and oxidation; avoid the use of dissimilar metals, use hot dip galvanizing, inorganic zinc coating or use other methods to provide protection or use moisture control to prevent galvanic action and oxidation. Verification shall be by conditioning in accordance with the requirements of Section 14 as required by type and by inspection.

7.10 *Rescue Lines*—Rescue lines shall be made from steel wire rope, textile rope, polymer fiber ropes, webbing or composite materials and comply with the requirements of this standard sections 9.2 and 9.3. Rescue lines shall be designed so that a tool must be used to remove them from the CDD system. Verification of compliance shall be by testing in accordance with sections 16.1 and 16.2 of this specification.

7.10.1 *Steel Cable Rescue Line*—Each steel cable, wire rope rescue line shall be made of a single length of galvanized steel wire rope. The wire rope shall be of a type, which can be visually inspected and shall be subjected to the manufacturer's inspections and non-destructive tests to verify that the steel cable rescue line is acceptable for its intended use. Steel cable rescue line may be jacketed with neoprene after the rescue line has been subjected to the manufacturer's inspections and non-destructive tests.

7.10.2 *Textile Rope*—Textile rope may be used in CDD Systems from the maximum rated height of 35 m; shall be of a kern mantel construction and made of a single length and have a minimum melting point of 195°C. Verification shall be by inspection and non-destructive test.

7.10.3 *Polymer Fiber Rope*—Polymer fiber rope may be used in CDD systems from the maximum height of 35 m and shall be made from a single length. Verification shall be by inspection and non-destructive test.

7.10.4 *Webbing Rescue Line*—Webbing, used instead of rope may be used in CDD Systems from a maximum rated height of 35 m; shall be made from a single length and manufactured in accordance with the requirements of EN 1891: Sections 4.1, 4.5 and 4.6. Verification shall be by inspection and non-destructive test.

7.10.5 *Composite Rescue Line*—Composite rescue lines, which are made from, steel cable and other materials shall be made from a single length of the composite and shall be manufactured in accordance with the manufacturer's specifications and standards. The composite rescue lines shall comply with the flame and fire resistance requirements of sections 8.3, 8.3.1, 8.3.2 and 8.3.3 of this standard. Verification shall be by inspection and non-destructive test.

7.10.6 *Terminations*—Rescue lines shall be supplied with permanent terminations. All terminations shall be made so that it shall be possible to inspect them visually unless they are located inside a cable spool. Terminations shall be designed so that they can only be opened by means of a tool, reference prEN 341:2002, 4.1.4. All terminations shall have at least 90 % of the descent lines required strength. Verification shall be in accordance with the requirements of 16.11

7.11 *Descent Rails and Tracks*—Descent rails and tracks used with Class G and Class H CDD systems shall be made from stainless steel or other materials that provide corrosion resistance. Rails and tracks shall be constructed in sections that connect together in a manner that maintains alignment and provides a smooth transition from section to section.

7.11.1 *Installation Static and Dynamic Strength*—Each rail or track section shall be anchored to the building using multiple anchors. Each installed sections of descent rails and tracks shall provide the static and dynamic strength required by sections 9.2 and 9.4 of this standard. Testing shall be in accordance with sections 16.1 and 16.2.

8. Physical Properties

8.1 *General Design Requirements*—CDD systems shall be designed so that they are capable of remaining in place, stored or installed, inside or outside multi-story buildings for a minimum of 10 years when the periodic inspections and maintenance are conducted in accordance with the manufacturer's requirements and procedures, in accordance with 7.2 through 7.2.2.

8.1.1 *Design*—The Basic concepts and general principles of design contained in EN 292-1:1991 shall be used during the design process. Anchors and escape openings that are determined to be necessary shall be installed and all preparations made so the CDD Systems are continually ready for use. CDD Systems may be designed in a variety of configurations to satisfy the applicable requirements of this standard. Systems may employ mounted or anchored CDDs with descending rescue lines, anchored rescue lines with descending CDDs which the rescue line passes through or from which the rescue line is dispensed, or CDDs that descend on pre-installed rails or tracks.

8.1.2 *Rescue Harness Use*—All CDD System designs require that people using the CDD must wear a rescue harnesses required by this standard or special rescue harnesses for children or invalids that are selected by the manufacturer, reference sections 9.6 through 9.6.3. The harness may be attached to a rescue line, to a CDD, which dispenses the rescue line, or to a CDD that descends on a rail or a track.

8.1.3 *Packaged Ready for Use*—CDD systems may be packaged to include ancillary components that are necessary to provide a complete system that is ready for use. Verification shall be by inspection and review of the manufacturer's documents.

8.2 *Hazard and Risk*—The manufacturer of each CDD System, or their authorized representative shall accomplish a hazard and risk analysis for each CDD installation, in accordance with the requirements of 8.2.1 through 8.2.4.2. The CDD system manufacturer or their representative shall advise the purchaser and those intending to use the CDD systems of the hazards and risks associated with their use during emergency situations.

8.2.1 *Falling Debris*—When fire or other evens are occurring above the evacuating person falling debris may present a hazard during evacuation.

8.2.2 *Human Tenability Analysis*—A human tenability analysis that considers high temperature, smoke and other

products of combustion shall be conducted by the CDD system manufacturer. The manufacturer or their representative shall utilize the tenability requirements cited in NFPA 130, Annex B2.1.1 or BSi 7974-6, Annex G, Tables G-2 and G-3 or other standards and technical resources that contain relevant human tenability information. The manufacturer may use the referenced standards and other technical resources that are available now, or become available in the future, to analyze the tenability of people using their specific CDD systems under the conditions specified in 8.3 of this standard.

8.2.3 *Suspended Trauma Syndrome*—Suspension in some rescue harnesses may result in Suspended Trauma Syndrome if the individual's legs are kept absolutely motionless during suspension, unless the person moves their legs during descent or uses special rescue harnesses. The CDD system manufacturer or their representative shall provide specific instruction or special harnesses to reduce this risk to an acceptable level.

8.2.4 *Installation site Hazard and Safety Analysis*—The manufacturer or his representative shall conduct a hazard and safety analysis of each CDD system installation site. Hazards such as set backs, obstructions, power lines, obstacles at the landing site and other hazards to the rescue shall be identified and avoided to the extent possible in the selection of the installation site and the evacuation route.

8.2.4.1 *Installation Site Inspection*—Site inspections shall be conducted, by the manufacturer or their representative to verify that the selected evacuation route is safe, determine the exact location for the installation of anchors and mounts, verify the accessibility of the CDD system, determine whether a special evacuation opening must be installed to provide access to the outside of the building and to determine if shields are required to prevent rescue line abrasion on building structures, during use. Safe and ready access to the CDD system shall be verified by inspection, conducted by the manufacturer or their representative. The safety analysis shall determine whether procedures exist to prevent or discourage the use of special access openings and CDD systems when there is no evacuation emergency and if they don't exist the manufacturer's representative shall recommend that they be created.

8.2.4.2 *Installation Height*—The hazard and safety analysis shall address those hazards unique to the height of use at each CDD system installation site. Predicted potential wind velocity, in the geographic region where the installation is made, and the time of exposure to the hazards identified in sections 8.2.1 through 8.2.4 shall be included in this analysis as they relate to each specific installation and to the specific characteristics of the manufacturer's CDD system. The projected area of wind loading for one person shall be assumed to be 0.7 m^2 and the wind load shall be calculated based on the force of 7.3 N/m^2 multiplied by the wind velocity in km/h, Reference the applicable sections of ASCE 7-05 or ASME A120.

8.3 *Flame and Fire Resistance*—CDD Systems including rescue lines, rail, tracks and all component parts of the system shall be resistant to the temperatures resulting from exposure to flame and fire and shall provide safe operation during and after exposure in accordance with the requirements of sections 8.3.1 through 8.3.3.1.

8.3.1 *Fixed CDD Systems, Anchors, Rails and Tracks*—Anchored CDDs, their anchors and the anchors used with CDD Systems that employ rails or tracks, shall be capable of safe operation during and after exposure to 200°C for a period of time equal to the longest descent time based on the maximum rated height and the rate of descent, for each CDD System design. The longest descent time shall be defined by the manufacturer and clearly marked on each CDD. Flame exposure testing shall be performed in accordance with 16.9.1.

8.3.2 *Anchored Rescue Lines*—Segments of rescue lines, used with descending CDDs shall be capable of safe use during and after exposure to 300°C for a period of time equal to 60 % of the longest descent time based on the maximum rated height and the rate of descent. The longest descent time shall be defined by the manufacturer and clearly marked on each CDD. Testing shall be performed in accordance with 16.9.2.

8.3.3 *Descending Rescue Lines, Non-Metallic Parts and Components*—Descending rescue lines, and external non-metallic components which descend during rescue shall be protected from, or independently capable of, withstanding exposure to 300°C, for a period of time equal to the longest time it takes for the CDD to descend through 2.5 m of exposure to this temperature as defined by the manufacturer and confirmed by test results. Testing shall be in accordance with Section 16.

8.3.3.1 *Class A and B Rescue Lines and Non-Metallic Parts*—Descending rescue lines that are retrieved for repetitive rescue descents shall be protected from, or independently capable of, withstanding exposure to 300°C, for a period of time equal to the longest time it takes to be retrieved a distance of 2.5 m. The manufacturer shall define this time period.

8.4 *Protection from Insects, Rodents and Birds*—CDD systems, component parts and enclosures shall be designed to prevent damage, degradation or interference with operation resulting from contamination, obstruction or the presence of insects, rodents and birds. Verification shall be by inspection.

8.5 *Electrical Energy*—CDD systems that use electrical energy may use building power sources when they are available and shall provide an independent electrical power source, for use when building power is not available. All electrical equipment and wiring shall comply with all applicable codes at the location of the installation. Verification shall be by inspection and review of the manufactures technical documents.

8.5.1 *Grade 1 and Grade 3 CDD Systems*—Grade 1 and Grade 3 CDD Systems that use electrical components and are installed in protected areas shall be designed in accordance with the requirements of NEMA 250. Verification shall be by inspection and review of the manufacturers test data to confirm compliance with the requirements of NEMA 250 and testing in accordance with 16.6.

8.5.2 *Grade 2 CDD Systems*—Grade 2 CDD Systems that use electrical components and are installed in unprotected areas shall be designed to insure that the electrical parts are protected and shall be designed in accordance with the minimum rating of NEMA 250. Verification shall be by inspection and review of the manufacturers test data to confirm compliance to the requirements of NEMA 250 and testing in accordance with 16.6.