ULTRA-SAFE INC.

April 20th, 2018

Concerning SME Rigging who has put out a report on full body harnesses and lanyards claiming ULTRA-SAFE, INC does not meet the latest ANSI code, and the product does not perform. The Z359.1-07, Z359.13-14, and Z359.1-14 ANSI standards are acceptable by OSHA.

In regards to the lanyards, the industry is divided between the two standards (Z359.1-07 & Z359.13-14) some like to strictly use the .1-07, while others choose the .13-14. Most steel erectors when working on catenary lines prefer the .1-07, as it has a 42" pull-out vs the .13-14 standard that has a 60" pull-out. With the longer pull-out there is a greater risk for the end user to possibly have a lower level contact.

Catenary lines: we have recorded several drops since 1995 and have not witnessed a lanyard fully deploy and/or any failures. The catenary line is not a rigid system and will absorb forced energy. The HD lanyard designed to take a force, as the body of the lanyard has internal shock absorbing capabilities to deploy around 400lbs. and stretch up to 10", if the force applied is greater, the exterior shock absorbing pack will deploy around 500lbs.

It would be difficult to create the same fall that a person has out in the field, as they may fall , feet first, sideways, arms out, backwards, head first, etc..... There is not a perfect fall, every situation would be different, as the lanyard would react differently if they were to fall feet first, than if they were to fall head first, both drops would deploy the energy absorbing elements, but with different drop force produced. All falls would need to be investigated, to gather information, to assess why a harness or lanyard reacted to the type of fall that was generated.

Cullen M Sharp

President

UTRA-SAFE, INC

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May 8, 2018

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Weldon Mann, VP Environment Health Safety
SME Steel Contractor
Weldon.mann@smesteel.com

Re: SME Steel Contractor's Presentation regarding Ultra-Safe's products.

Dear Mr. Mann:

This law firm represents Ultra-Safe Inc. ("Ultra-Safe") with regards to the inaccurate information regarding Ultra-Safe's full-body harness and lanyards set forth in SME Steel Contractor's ("SME's") presentation regarding an event that took place at Chase Arena on or about February 18, 2018. Specifically, SME's presentation states that: "Ultra Safe Fall Protection is not meeting the latest ANSI fall protection code. Z359.1-2016 & Z359.13-2013."

SME's statement is false. Further, SME's statement was then broadly circulated at a safety managers' meeting organized by Mortenson Construction and Clark Construction, causing Ultra-Safe significant harm from repeated publication of incorrect statements.

Contrary to SME's statement, Ultra-Safe's products are compliant with the ANSI standards accepted by OSHA; specifically the Z359.1-07, Z359.13-14 and Harness Z359.11-14 ANSI standards. As you likely know, industry standards accept either the Z359.1-07 or Z359.13-14. We are enclosing with this letter a letter from Ultra-Safe discussing the technical aspects of its products and excerpts from an Intertek Test Report evidencing that Ultra-Safe's harnesses and lanyards are ANSI compliant and also an information sheet discussing in more detail Ultra-Safe's safety features.

SME's presentation further portrays Ultra-Safe as refusing to provide information regarding deployment force, that Ultra-Safe's harness did not work correctly, and that Ultra-Safe's exterior shock-absorbing pack did not deploy. All statements were incorrect and have caused Ultra-Safe harm.

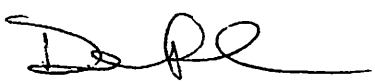
In an attempt to mitigate the harm caused by SME, Ultra-Safe would appreciate the opportunity to discuss its products with you to correct your understanding of Ultra-Safe's product manuals and capabilities. For example, for catenary lines (which are not rigid and therefore absorb some energy in the lines), Ultra-Safe has recorded several drops since 1995 and Ultra-Safe has not witnessed a lanyard fully deployed or any product failures. Moreover, Ultra-Safe's HD lanyard has internal shock absorbing capabilities which will deploy around 400 pounds of force and will stretch up to 10 inches. If the force exceeds the internal shock absorbing capabilities, the external shock absorbing pack will deploy at around 500 pounds of force. The force of the fall is also greatly impacted by the

facts of each fall as well (whether or not a person falls feet first, sideways, arms out, etc.), which also impacts the reaction of the lanyard.

In addition to our invitation to discuss our products, Ultra-Safe requests that SME ensure that no other presentations or meetings contain the incorrect assertion of fact that "Ultra Safe Fall Protection is not meeting the latest ANSI fall protection code. Z359.1-2016 & Z359.13-2013" or otherwise incorrectly portray Ultra-Safe's product capabilities.

We request a response by May 11, 2018 either accepting Ultra-Safe's invitation to discuss its products in more detail, or confirmation that SME (or Mortenson Construction or Clark Construction) will refrain from making any other false statements regarding Ultra-Safe.

Very truly yours,



Jay A. Zweig

Daniel P. Crane

JAZ:car

FERNANDO BARRERA

From: FERNANDO BARRERA <fdo@ultrasafeusa.com>
Sent: Monday, June 11, 2018 3:47 PM
To: 'roy@cablemoore.com'
Cc: 'ralphjr@wasternstatestool.com'
Subject: LANYARD 96516KLCA
Attachments: 2018_06_11_14_35_06.pdf

Importance: High

Gentlemen,

We are emailing you in regards to an alert that was issued on the chase center jobsite. Cable Moore & Western State tool & Supply are the only 2 distributors that purchase this custom made lanyards assemblies. We would like to make you aware of the situation and to also see if you have had any feedback from your customers regarding this custom lanyard 96516KLYCA.

You may contact Marty @ (602)292-0334

Best regards,

Fernando Barrera
Ultra-Safe
Ph: (602) 484-7713
Fax: (602) 278-5075
Email: fdo@ultrasafeusa.com

ULTRA-SAFE INC
"The Ultimate in Fall Protection"

SME STEEL

May 14, 2018

Via E-mail & U.S. Mail
Jay A. Zweig
Bryan Cave Leighton Paisner
Two North Central Ave., Suite 2100
Phoenix, AZ 85004

Re: Ultra-Safe Fall Protection Equipment

Dear Mr. Zweig:

I am General Counsel of SME Industries, Inc. and its subsidiary SME Steel Contractors, Inc. (collectively referred to as "SME"). This letter is written in response to your letter of May 8, 2018 to Weldon Mann, SME's Vice-President of Health Safety, regarding allegedly inaccurate information regarding Ultra-Safe personal fall protection equipment contained in a written report prepared by Mr. Mann and others regarding a safety incident at the Chase Arena on May 18, 2018.

Please be aware of the following: At approximately 9:30 am on February 18, 2018 an ironworker employee of SME who was working as a connector for the erection of structural steel on the Chase Arena project in San Francisco experienced an "arrested fall" event while guiding a steel beam into place. The worker was wearing personal fall protection equipment manufactured by Ultra-Safe, including a full body harness and shock absorbing lanyard, which were connected to a catenary line on the structure. SME's employee did not suffer serious injuries. Nonetheless, as part of its customary safety practices—and at the request of the Chase project's general contractor—SME suspended erection activities at the site and conducted an investigation into the event's causes and the performance of the personnel and equipment involved. As part of this process, representatives of SME and the project's general contractor contacted Marty Sharp of Ultra-Safe by telephone. These parties invited Mr. Sharp or another representative of Ultra-Safe to participate in the investigation. He declined or refused to do so. Because it appeared that Ultra-Safe shock absorbing lanyard involved in the incident had not deployed, the investigating parties asked Marty Sharp to provide the "designed deployment force" for the shock pack. Mr. Sharp refused to provide this information and suggested that SME and the project's general contractor "contact Ultra-Safe's attorneys" if they wanted any information. Obviously, these responses from Mr. Sharp were not helpful and called into question the Ultra-Safe fall protection equipment in use at the Chase Arena jobsite.

Weldon Mann and others working with him completed their investigation of this event and prepared a written report that was presented to Mortensen-Clark, the general contractor for the Chase Arena project. That report concluded that the fall was caused by the actions of the

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ironworkers/connector who placed himself in the path of the beam being lowered into place. The report noted that both of the connectors who were involved and the "phone man" who was communicating with the crane operator failed to recognize the hazard. SME's safety report also noted the following facts about the Ultra-Safe lanyard worn by the ironworker involved in the incident: (1) the lanyard's energy absorbing pack did not deploy (though the lanyard itself stretched approximately 6 inches in the fall); (2) the manual for the lanyard contains apparently contradictory references to both 6 foot and 12 foot freefalls; (3) Ultra-Safe personnel refused to provide information about lanyard's deployment forces or other performance specifications when contacted as part of the safety investigation; and (4) the Ultra-Safe lanyard did not appear to be labelled and otherwise comply with latest ANSI standards.

Nothing in SME's investigation or incident report relates in any way to the Ultra-Safe full body harness worn by SME's employee. Nor did SME's report state or imply that "Ultra-Safe's harness did not work correctly," as stated in your letter. Similarly, SMEs investigation did not conclude and its written incident report does not state that the fall protection equipment manufactured and sold by Ultra-Safe are unsafe. Indeed, the fall of SME's employee was appropriately arrested and serious injuries averted by his use of Ultra-Safe equipment. That said, however, SME's investigation into this incident *was* hampered by Ultra-Safe's refusal to participate in the investigation or provide information regarding deployment forces and other performance specifications for its equipment. Finally, SME does not agree that the Ultra-Safe equipment supplied for this project meets the latest ANSI standards.

Your letter states that *either* ANSI Z359.1-07 or Z359-13-14 standards are acceptable in the industry. This is not correct. After August 14, 2017, which is the effective date for ANSI standard Z359.1-2016, it is improper to claim conformity with ANSI based on compliance with previous ANSI standards. Indeed Section ANSI Z359-2016 1.2.4 states "Manufacturer shall not continue to market any product component or system as compliant with any previous editions of ANSI/ASEE Z359.1 after the effective date of this standard." Thus, all fall protection harnesses and lanyards manufactured after August 14, 2017 need to meet ANSI Z359.1-2016 and ANSI Z359-13.13 to meet the latest ANSI specifications.

In your letter you suggest that SME meet with representatives of Ultra-Safe to discuss its fall protection products. Respectfully, the time that such meeting would have been helpful is when it was requested by SME and Mortensen Clark as part of the investigation at the Chase Center. SME does not believe that it has made any false statements regarding Ultra-Safe or its products. Nonetheless, SME will refrain from making any comments about Ultra-Safe or its products to third parties. Finally, to the extent the Ultra-Safe fall protection harnesses and lanyards now in SME's possession were manufactured and/or sold to SME after August 14, 2017, this equipment is not compliant with latest ANSI standards and SME requests that such equipment be repurchased or otherwise returned for its full purchase price.

Please feel free to contact me if you have any questions or concerns about the foregoing. Given the fact that Weldon Mann and other SME employees are represented by counsel, please refrain from any further direct communications with them.

Protecting workers, our customers, our partners, and the general public is of utmost importance to Mortenson.
When we say Zero Injuries, we mean it!
Mortenson Safety Alert 2018 – 007
Manufacturer's Defect on Ultra-Safe Shock-absorbing Lanyard
Incident Date: 06/08/2018

Safety Alert!

Manufacturer's Defect on Ultra-Safe Shock-absorbing Lanyard

Problem Description
During visual inspection of fall protection equipment, a trade partner iron worker apprentice at the Chase Center project in San Francisco, CA discovered that his shock-absorbing lanyard had not been stitched together. The lanyard strap was merely lapped through the eye of the shock pack, with glue holding it together. Presumably, the glue is used during the manufacturing process to hold the material in place during the stitching process. There was no evidence that it had ever been stitched or inspected for quality at the factory before packaging and shipment to the trade partner.

Problem Scope

Use of any fall arrest equipment without performing a thorough visual inspection of all components for manufacturing defects prior initial use, and for damage every use thereafter, poses risk of serious and possibly fatal injuries to any user.

While the potential for manufacturer defects exists with any product, this is not the first product issue identified at the Chase Center project involving Ultra-Safe fall arrest equipment. In March of this year, an ironworker fell during steel erection activities. The fall was successfully arrested and the worker was not injured, however the shock absorber on the ironworker's lanyard did not deploy during the fall arrest.

Since the manufacturer to date has resisted attempts to investigate and been unwilling to understand the nature and scope of these apparent manufacturing defects, the full scope of the potential problem involving Ultra Safe fall arrest equipment is not known.

Problem Impact

Fall arrest manufacturing defects and subsequent equipment performance failures have a high potential to result in serious, if not fatal injuries.

Problem Containment

As of the date of this alert, Ultra-Safe has not issued a bulletin to raise awareness of an issue or advise users to inspect, nor have they issued a voluntary product recall.

In collaboration with the affected trade partner, the Mortenson/Clark Joint Venture team at Chase Center has taken the following actions:

- A project wide Alert was issued to all trade partners at the Chase Center project, advising them of the potential defects with Ultra-Safe fall arrest equipment.
- Continued use of the Ultra-Safe brand has been prohibited for the duration of the project.
- The steel erection trade partner immediately removed all Ultra-Safe fall arrest equipment from use, and replaced with equipment from a different manufacturer.
- This issue and the importance of pre-use inspection of fall arrest equipment has been reinforced at a project All Hands Meeting. The apprentice that discovered and reported the defect was recognized for his diligence in pre-use inspection, and for helping raise broad awareness to the issue.

Preventive Actions

While Ultra-Safe is not a preferred brand of fall arrest equipment for Mortenson, all project teams are asked to communicate this alert to Mortenson workers, joint venture partners, and trade partners in effort to make them aware of the potential issues with this particular manufacturer.

The importance of pre-use inspection of all fall arrest equipment by workers, daily at minimum, cannot be overstated. Regardless of manufacturer brand, it is imperative to inspect all equipment components immediately upon opening the package, and before initial use to identify any defects or damage that may have occurred during the manufacturing or shipping process.

As part of a tool box talk or job-wide safety meeting, all projects are encouraged to engage workers in thorough inspection of all fall arrest equipment on site.

Contacts for more information

Mohamed Higazy, Project Safety Director
Sports & Entertainment Group
(901) 233-8166
Mohamed.higazy@mortenson.com

Trevor Delong, Sr. Superintendent
Sports + Entertainment
(720) 281-2161
Trevor.Delong@mortenson.com

The project team involved investigated the scope of these problems and collected information on contributing factors. We need your help!! Please determine if this issue impacts your project and, if so, collect facts, impacts, contributing factors and any recommended solutions associated with this issue and forward them to Marni Hogen, Director of EHS (763-287-5135).

ULTRA-SAFE INC.

June 18th, 2018

Ref: Safety Alert

On the morning of June 11 2018, ULTRA-SAFE received a phone call from Federal OSHA in Washington DC to inform us about a safety alert that was issued by Mortensen/Clark Construction on June 8th 2018. OSHA could only provide us with a serial # from a harness that was in one of the pictures in the safety alert.

ULTRA—SAFE, also received an email of the Safety Alert on the morning of June 11 2018. After reading the pages of the alert, ULTRA — SAFE began, an internal investigation of the product involved and discovered that this type of lanyard is a custom lanyard that was manufactured for only two distributers, Cable Moore in Oakland, CA and Western States Tool in Hayward, CA. Both distributers sold this lanyard to Cal Erectors.

ULTRA-SAFE then immediately contacted the two distributers to make them aware of the safety alert and informed our distributers to do the following....

1. Inspect their inventory
2. Identify your customer (Cal Erectors)
3. Make contact and Send a copy of the safety alert to the customer
4. Customers were to be instructed to contact ULTRA-SAFE about the product lanyard in the safety alert.

Unfortunately, the serial # on the lanyard was missing, and ULTRA-SAFE was not provided with any further information on the lanyard. Based on the serial # provided by OSHA and corresponding safety alert, our findings show that the lanyards were sold to Cable Moore during that period, ULTRA-SAFE has determined that 20 pc's were manufactured. Because of this nonconformance, (REF: D.T. # 543715 / P.O. # 802499-00) and in order to take the most prudent course of action possible, ULTRA-SAFE has implemented additional production safeguard, labeling, and most importantly adding an additional quality control station.

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ULTRA-SAFE then contacted the Federal OSHA representative and informed him of the course of action taken to remedy the issue, and he stated, "We are taking the appropriate corrective measures".

ULTRA—SAFE remains committed to providing high quality products and services, we take pride in the work that we do, and we sincerely apologize for any inconvenience.

We want to remind users to conduct a Pre-Use Inspection of all fall protection equipment prior to each use, as per the instructions in the user manuals. If you have any questions, please direct any question or concerns that you may have to myself at (800) 850-5914.

Thank you for your continued support and use of ULTRA-SAFE products and services.

Marty Sharp

President

ULTRA—SAFE, INC

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To Jay,

Please provide us with the information where Cal OSHA has adopted the 2016 voluntary ANSI standard by amendment to replace Subpart R Steel Erection regulations for the iron work industry...

Misstatements by SME

Note: The lanyard in question, did not stretch, it deployed approximately 6", maybe about 2G's of force. More of a roll-out freefall, the lanyard worked as it was designed to, and the user was not injured.

Iron workers industry under the Federal OSHA Subpart R mandatory regulation, the steel erection industry has not adopted and/or working under the 2016 ANSI voluntary standard.

For more information on this go to the safety alert section at www.ultrasafeusa.com

Concerning the harness, according to the pullout on the lanyard, it was approximately 2 G's. The harness is like a 2 leg grommet, this would split the load to 200 lbs. per side. Far too less to rip the safety stitch. It would take almost double to do that. There was nothing wrong with the harness.

1926.760(c)(5)
Unsecured decking in a CDZ shall not exceed 3,000 square feet (914.4 m^2).

1926.760(c)(6)
Safety deck attachments shall be performed in the CDZ from the leading edge back to the control line and shall have at least two attachments for each metal decking panel.

..1926.760(c)(7)

1926.760(c)(7)
Final deck attachments and installation of shear connectors shall not be performed in the CDZ.

1926.760(d)
Criteria for fall protection equipment.

1926.760(d)(1)
Guardrail systems, safety net systems, personal fall arrest systems, positioning device systems and their components shall conform to the criteria in § 1926.502 (see Appendix G to this subpart).

1926.760(d)(2)
Fall arrest system components shall be used in fall restraint systems and shall conform to the criteria in § 1926.502 (see Appendix G). Either body belts or body harnesses shall be used in fall restraint systems.

1926.760(d)(3)
Perimeter safety cables shall meet the criteria for guardrail systems in § 1926.502 (see Appendix G).

1926.760(e)
Custody of fall protection. Fall protection provided by the steel erector shall remain in the area where steel erection activity has been completed, to be used by other trades, only if the controlling contractor or its authorized representative:

1926.760(e)(1)
Has directed the steel erector to leave the fall protection in place; and

1926.760(e)(2)
Has inspected and accepted control and responsibility of the fall protection prior to authorizing persons other than steel erectors to work in the area.

[66 FR 5272, Jan. 18, 2001]

Next Standard (1926.761)

Regulations (Standards - 29 CFR) - Table of Contents

UNITED STATES
DEPARTMENT OF LABOR

Occupational Safety and Health Administration
200 Constitution Ave NW
Washington, DC 20210
800-321-6742 (OSHA)
TTY
www.OSHA.gov

FEDERAL GOVERNMENT

White House
Disaster Recovery Assistance
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- **Part Number:** 1926
- **Part Title:** Safety and Health Regulations for Construction
- **Subpart:** R
- **Subpart Title:** Steel Erection
- **Standard Number:** 1926.760
- **Title:** Fall protection.
- **GPO Source:** e-CFR

1926.760(a)

General requirements.

1926.760(a)(1)

Except as provided by paragraph (a)(3) of this section, each employee engaged in a steel erection activity who is on a walking/working surface with an unprotected side or edge more than 15 feet (4.6 m) above a lower level shall be protected from fall hazards by guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.

1926.760(a)(2)

Perimeter safety cables. On multi-story structures, perimeter safety cables shall be installed at the final interior and exterior perimeters of the floors as soon as the metal decking has been installed.

1926.760(a)(3)

Connectors and employees working in controlled decking zones shall be protected from fall hazards as provided in paragraphs (b) and (c) of this section, respectively.

1926.760(b)

Connectors. Each connector shall:

1926.760(b)(1)

Be protected in accordance with paragraph (a)(1) of this section from fall hazards of more than two stories or 30 feet (9.1 m) above a lower level, whichever is less;

1926.760(b)(2)

Have completed connector training in accordance with § 1926.761; and

1926.760(b)(3)

Be provided, at heights over 15 and up to 30 feet above a lower level, with a personal fall arrest system, positioning device system or fall restraint system and wear the equipment necessary to be able to be tied off; or be provided with other means of protection from fall hazards in accordance with paragraph (a)(1) of this section.

1926.760(c)

Controlled Decking Zone (CDZ). A controlled decking zone may be established in that area of the structure over 15 and up to 30 feet above a lower level where metal decking is initially being installed and forms the leading edge of a work area. In each CDZ, the following shall apply:

1926.760(c)(1)

Each employee working at the leading edge in a CDZ shall be protected from fall hazards of more than two stories or 30 feet (9.1 m), whichever is less.

1926.760(c)(2)

Access to a CDZ shall be limited to only those employees engaged in leading edge work.

1926.760(c)(3)

The boundaries of a CDZ shall be designated and clearly marked. The CDZ shall not be more than 90 feet (27.4 m) wide and 90 (27.4 m) feet deep from any leading edge. The CDZ shall be marked by the use of control lines or the equivalent. Examples of acceptable procedures for demarcating CDZ's can be found in Appendix D to this subpart.

1926.760(c)(4)

Each employee working in a CDZ shall have completed CDZ training in accordance with § 1926.761.

system alone [i.e. without the warning line system] is permitted.

(11) *Steep roofs.* Each employee on a steep roof with unprotected sides and edges 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems with toeboards, safety net systems, or personal fall arrest systems.

(12) *Precast concrete erection.* Each employee engaged in the erection of precast concrete members (including, but not limited to the erection of wall panels, columns, beams, and floor and roof "tees") and related operations such as grouting of precast concrete members, who is 6 feet (1.8 m) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems, unless another provision in paragraph (b) of this section provides for an alternative fall protection measure. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of § 1926.502.

Note: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above-listed fall protection systems. Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with § 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.

(13) *Residential construction.* Each employee engaged in residential construction activities 6 feet (1.8 m) or more above lower levels shall be protected by guardrail systems, safety net system, or personal fall arrest system unless another provision in paragraph (b) of this section provides for an alternative fall protection measure. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of § 1926.502.

Note: There is a presumption that it is feasible and will not create a greater hazard to implement at least one of the above-listed fall protection systems. Accordingly, the employer has the burden of establishing that it is appropriate to implement a fall protection plan which complies with § 1926.502(k) for a particular workplace situation, in lieu of implementing any of those systems.

(14) *Wall openings.* Each employee working on, at, above, or near wall openings (including those with chutes attached) where the outside bottom edge of the wall opening is 6 feet (1.8 m) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1.0 m) above the walking/working surface, shall be protected from falling by the use of a guardrail system, a safety net system, or a personal fall arrest system.

(15) *Walking/working surfaces not otherwise addressed.* Except as provided in § 1926.500(a)(2) or in § 1926.501(b)(1) *through* (b)(14), each employee on a walking/working surface 6 feet (1.8 m) or more above lower levels shall be protected from falling by a guardrail system, safety net system, or personal fall arrest system.

(c) ***Protection from falling objects.*** When an employee is exposed to falling objects, the employer shall have each employee wear a hard hat and shall implement one of the following measures:

(1) Erect toeboards, screens, or guardrail systems to prevent objects from falling from higher levels; or,

(2) Erect a canopy structure and keep potential fall objects far enough from the edge of the higher level so that those objects would not go over the edge if they were accidentally displaced; or,

(3) Barricade the area to which objects could fall, prohibit employees from entering the barricaded area, and keep objects that may fall far enough away from the edge of a higher level so that those objects would not go over the edge if they were accidentally displaced.

§ 1926.502 Fall protection system criteria and practices.

(a) ***General.*** (1) Fall protection systems required by this part shall comply with the applicable provisions of this section.

(2) Employers shall provide and install all fall protection systems required by this subpart for an employee, and shall comply with all other pertinent requirements of this subpart before that employee begins the work that necessitates the fall protection.

(b) ***Guardrail systems.*** Guardrail systems and their use shall comply with the following provisions:

(1) Top edge height of top rails, or equivalent guardrail system members, shall be 42 inches (1.1 m) plus or minus 3 inches (8 cm) above the walking/working level. When conditions warrant, the height of the top edge may exceed the 45-inch height, provided the guardrail system meets all other criteria of this paragraph.

Note: When employees are using stilts, the top edge height of the top rail, or equivalent member, shall be increased an amount equal to the height of the stilts.

(2) Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working surface when there is no wall or parapet wall at least 21 inches (53 cm) high.

(i) Midrails, when used, shall be installed at a height midway between the top edge of the guardrail system and the walking/working level.

(ii) Screens and mesh, when used, shall extend from the top rail to the walking/working level and along the entire opening between top rail supports.

(iii) Intermediate members (such as balusters), when used between posts, shall be not more than 19 inches (48 cm) apart.

(iv) Other structural members (such as additional midrails and architectural panels) shall be installed such that there are no openings in the guardrail system that are more than 19 inches (.5 m) wide.

(3) Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds (890 N) applied within 2 inches (5.1 cm) of the top edge, in any outward or downward direction, at any point along the top edge.

(4) When the 200 pound (890 N) test load specified in paragraph (b)(3) of this section is applied in a downward direction, the top edge of the guardrail shall not deflect to a height less than 39 inches (1.0 m) above the walking/working level. Guardrail system components selected and constructed in accordance with Appendix B to subpart M of this part will be deemed to meet this requirement.

(5) Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members shall be capable of withstanding, without failure, a force of at least 150 pounds (666 N) applied in any downward or outward direction at any point along the midrail or other member.

(6) Guardrail systems shall be so surfaced as to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing.

(7) The ends of all top rails and midrails shall not overhang the terminal posts, except where such overhang does not constitute a projection hazard.

(8) Steel banding and plastic banding shall not be used as top rails or midrails.

(9) Top rails and midrails shall be at least one-quarter inch (0.6 cm) nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for top rails, it shall be flagged at not more than 6-foot intervals with high-visibility material.

(10) When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section shall be placed across the access opening between guardrail sections when hoisting operations are not taking place.

(11) When guardrail systems are used at holes, they shall be erected on all unprotected sides or edges of the hole.

(12) When guardrail systems are used around holes used for the passage of materials, the hole shall have not more than two sides provided with removable guardrail sections to allow the passage of materials. When the hole is not in use, it shall be closed over with a cover, or a guardrail system shall be provided along all unprotected sides or edges.

(13) When guardrail systems are used around holes which are used as points of access (such as ladderways), they shall be provided with a gate, or be so offset that a person cannot walk directly into the hole.

(14) Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge.

(15) Manila, plastic or synthetic rope being used for top rails or midrails shall be inspected as frequently as necessary to ensure that it continues to meet the strength requirements of paragraph (b)(3) of this section.

(c) ***Safety net systems.*** Safety net systems and their use shall comply with the following provisions:

(1) Safety nets shall be installed as close as practicable under the walking/working surface on which employees are working, but in no case more than 30 feet (9.1 m) below such level. When nets are used on bridges, the potential fall area from the walking/working surface to the net shall be unobstructed.

(2) Safety nets shall extend outward from the outermost projection of the work surface as follows:

Vertical distance from working level to horizontal plane of net	Minimum required horizontal distance of outer edge of net from the edge of the working surface.
Up to 5 feet	8 feet.
More than 5 feet up to 10 feet	10 feet.
More than 10 feet	13 feet.

(3) Safety nets shall be installed with sufficient clearance under them to prevent contact with the surface or structures below when subjected to an impact force equal to the drop test specified in paragraph (c)(4) of this section.

(4) Safety nets and their installations shall be capable of absorbing an impact force equal to that produced by the drop test specified in paragraph (c)(4)(i) of this section.

(i) Except as provided in paragraph (c)(4)(ii) of this section, safety nets and safety net installations shall be drop-tested at the jobsite after initial installation and before being used as a fall protection system, whenever relocated, after major repair, and at 6-month intervals if left in one place. The drop-test shall consist of a 400 pound (180 kg) bag of sand 30 ± 2 inches (76 ± 5 cm) in diameter dropped into the net from the highest walking/working surface at which employees are exposed to fall hazards, but not from less than 42 inches (1.1 m) above that level.

(ii) When the employer can demonstrate that it is unreasonable to perform the drop-test required by paragraph (c)(4)(i) of this section, the employer (or a designated competent person) shall certify that the net and net installation is in compliance with the provisions of paragraphs (c)(3) and (c)(4)(i) of this section by preparing a certification record prior to the net being used as a fall protection system. The certification record must include an identification of the net and net installation for which the certification record is being prepared; the date that it was determined that the identified net and net installation were in compliance with paragraph (c)(3) of this section and the signature of the person making the determination and certification. The most recent certification record for each net and net installation shall be available at the jobsite for inspection.

(5) Defective nets shall not be used. Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. Defective components shall be removed from service. Safety nets shall also be inspected after any occurrence which could affect the integrity of the safety net system.

(6) Materials, scrap pieces, equipment, and tools which have fallen into the safety net shall be removed as soon as possible from the net and at least before the next work shift.

(7) The maximum size of each safety net mesh opening shall not exceed 36 square inches (230 cm^2) nor be longer than 6 inches (15 cm) on any side, and the opening, measured center-to-center of mesh ropes or webbing, shall not be longer than 6 inches (15 cm). All mesh crossings shall be secured to prevent enlargement of the mesh opening.

(8) Each safety net (or section of it) shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds (22.2 kN).

(9) Connections between safety net panels shall be as strong as integral net components and shall be spaced not more than 6 inches (15 cm) apart.

(d) ***Personal fall arrest systems.*** Personal fall arrest systems and their use shall comply with the provisions set forth below. Effective January 1, 1998, body belts are not acceptable as part of a personal fall arrest system. Note: The use of a body belt in a positioning device system is acceptable and is regulated under paragraph (e) of this section.

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

(2) Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

(3) Dee-rings and snaphooks shall have a minimum tensile strength of 5,000 pounds (22.2 kN).

(4) Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(5) Snaphooks shall be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snaphook by depression of the snaphook keeper by the connected member, or shall be a locking type snaphook designed and used to prevent disengagement of the snaphook by the contact of the snaphook keeper by the connected member. Effective January 1, 1998, only locking type snaphooks shall be used.

(6) Unless the snaphook is a locking type and designed for the following connections, snaphooks shall not be engaged:

(i) directly to webbing, rope or wire rope;

(ii) to each other;

(iii) to a dee-ring to which another snaphook or other connector is attached;

(iv) to a horizontal lifeline; or

(v) to any object which is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement could occur by the connected object being able to depress the snaphook keeper and release itself.

(7) On suspended scaffolds or similar work platforms with horizontal lifelines which may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.

(8) Horizontal lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two.

(9) Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds (22.2 kN).

(10) (i) Except as provided in paragraph (d)(10)(ii) of this section, when vertical lifelines are used, each employee shall be attached to a separate lifeline.

(ii) During the construction of elevator shafts, two employees may be attached to the same lifeline in the hoistway, provided both employees are working atop a false car that is equipped with guardrails; the strength of the lifeline is 10,000 pounds [5,000 pounds per employee attached] (44.4 kN); and all other criteria specified in this paragraph for lifelines have been met.

(11) Lifelines shall be protected against being cut or abraded.

(12) Self-retracting lifelines and lanyards which automatically limit free fall distance to 2 feet (0.61 m) or less shall be capable of sustaining a minimum tensile load of 3,000 pounds (13.3 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(13) Self-retracting lifelines and lanyards which do not limit free fall distance to 2 feet (0.61 m) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(14) Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made from synthetic fibers.

(15) Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as follows:

(i) as part of a complete personal fall arrest system which maintains a safety factor of at least two; and

(ii) under the supervision of a qualified person.

(16) Personal fall arrest systems, when stopping a fall, shall:

(i) limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt;

(ii) limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;

(iii) be rigged such that an employee can neither free fall more than 6 feet (1.8 m), nor contact any lower level;

(iv) bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 m); and,

(v) have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

Note: If the personal fall arrest system meets the criteria and protocols contained in Appendix C to subpart M, and if the system is being used by an employee having a combined person and tool weight of less than 310 pounds (140 kg), the system will be considered to be in compliance with the provisions of paragraph (d)(16) of this section. If the system is used by an employee having a combined tool and body weight of 310 pounds (140 kg) or more, then the employer must appropriately modify the criteria and protocols of the Appendix to provide proper protection for such heavier weights, or the system will not be deemed to be in