



U. S. Department of Labor
Occupational Safety and Health Administration
Directorate of Science, Technology and Medicine
Office of Science and Technology Assessment

Hazards of Misusing Wire Form Anchorage Connectors for Fall Protection

Safety and Health Information Bulletin

SHIB 9-01-2004

Purpose

The purpose of this Safety and Health Information Bulletin is:

1. to remind employers and employees that personal fall arrest systems used in construction must meet the provisions of 29 *CFR* 1926.502 (d), and positioning device systems must meet the provisions of 29 *CFR* 1926.502 (e);
2. to alert users that they must follow the manufacturers' instructions regarding the intended use of wire form¹ anchorage connectors; and
3. to provide recommendations for employers and employees using the wire form anchorage connectors.

Background

The OSHA Bismarck Area Office investigated a fatal accident involving a spring-loaded wire form anchorage connector that was used in communication towers upgrade work. This anchorage connector is opened by compressing the two lower wires of the anchorage connector. On many wire form anchorage connectors, the top portion will open to form double hooks with an opening of 3-1/8" for a small connector and up to 5-1/2" opening for a large connector (Figure 1). The hooks are then connected to an anchorage (a secure means of attachment) as part of a personal fall arrest system or a positioning device system (Figure 2). The wire

This Safety and Health Information Bulletin is **not** a standard or regulation, and it creates no new legal obligations. The Bulletin is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace. The Occupational Safety and Health Act requires employers to comply with hazard-specific safety and health standards. In addition, pursuant to Section 5(a)(1), the General Duty Clause of the Act, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Employers can be cited for violating the General Duty Clause if there is a recognized hazard and they do not take reasonable steps to prevent or abate the hazard. However, failure to implement any recommendations in this Safety and Health Information Bulletin is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.

form anchorage connector is used frequently in the tower construction and maintenance industry as a



Figure 1

Spring-loaded Wire Form Anchorage Connector

¹These wire form anchorage connectors have the following names: Wire Anchorage Connector, Wire Form Pipe Hook, Wire Hook Anchorage Connector, and Wire Clasp™.



Figure 2

portable/temporary anchorage connector for personal fall arrest systems and for positioning device systems.

Accident Description

A communication tower erection and maintenance company employee was using a wire form anchorage connector while upgrading the structural members on a broadcasting tower. After completing work at the 65-foot level, the employee climbed to the 75-foot working level and connected the anchorage connector to a **diagonal** member of the tower. The employee also was wearing a personal fall arrest system. However, instead of connecting his personal fall arrest system directly to an anchorage, the employee used the wire form anchorage connector connecting assembly as a personal fall arrest system. When attached to the diagonal member, the anchorage connector was positioned in a manner such that, in the event of a fall, the employee's weight would exert a significant side load on the anchorage connector - a condition that the wire form anchorage connector is not designed to handle.

While moving back to his working position, the anchorage connector became lodged between a diagonal member and a horizontal member of the tower. Although the exact cause of the accident may never be definitively determined, the position of the anchorage connector between the diagonal and horizontal members and the weight of the falling employee may have exerted a force on the release

mechanism of the anchorage connector, resulting in an unintentional disengagement of the connector and permitting the employee to fall approximately 75 feet to the ground. The employee died as a result of the fall.

Other Information

The specifications and limitations for the wire form anchorage connector, as provided by a major manufacturer, are as follows:

Specifications:

- The anchorage connectors meet OSHA requirements and ANSI Z 359.1 provisions.
- The anchorage connector has a minimum breaking strength of 5000-pound force (22.2 kN).
- The anchorage connector is designed for the attachment of a single personal fall arrest system.
- The anchorage connector is for one person with a capacity of 310 pounds (140 kg) including weight of the user plus clothing, tools, and other user-borne objects.
- When the anchorage connector is used as part of a personal fall arrest system, the fall arresting force must not exceed 1,800-pound force (8 kN).

Limitations and Cautions:

- Select only anchorages of suitable size, strength and shape for use with the anchorage connector.
- The connecting hardware to the anchorage connector also must be compatibly designed in size, shape, and strength.
- **Always connect to a suitable overhead anchorage.** The anchorage connectors are designed to hook onto structures directly above the worker.
- **Do not apply a side load to the anchorage connector.**

- The potential fall arrest loads must be applied vertically to, and directly below, the anchorage connector.
- Avoid contact with nearby objects that could come into contact with the anchorage connector and cause interference with its intended use.
- Remove from service and destroy if an anchorage connector has been subjected to the forces of arresting a fall.

Conclusions

The wire form anchorage connector was a component of the connecting assembly for a personal fall arrest system as used in the incident described above. Its connection to a diagonal member of the tower was contrary to a major manufacturer's user instructions, which caution that the anchorage connector is not designed to support side loads and that installation must be planned so that potential fall arrest loads are applied **vertically** to, and directly below, the anchorage connector. The user instructions also provide that anchorage connector and anchorage point should be located a safe distance from any obstacles, and the anchorage connector should not come into contact with nearby objects.

In the situation described above, the movement of the anchorage connector to a non-vertical position between a horizontal and diagonal member of the tower likely resulted in the anchorage connector coming into contact with nearby objects. This movement may have resulted in a side load when the employee fell, which may have exerted force on the release mechanism of the anchorage connector, thus possibly permitting the disengagement of the anchorage connector.

Requirements and Recommendations

OSHA's construction standard for fall protection system criteria and practices 29 *CFR* 1926.502.²

29 *CFR* 1926.502 (d), contains requirements for *Personal fall arrest systems*.

29 *CFR* 1926.502 (e), contains requirements for *Positioning device systems*.

OSHA recommends that contractors and other employers review OSHA's requirements for the use of personal fall arrest systems and positioning device systems. Employers must only use personal fall arrest system connectors and positioning device system connectors that meet applicable OSHA regulations.

Employers must train employees on the appropriate use of personal fall arrest systems and positioning device systems and ensure that such systems are connected only to compatible components. Contractors and other employers should review manufacturer instructions and markings and must ensure that the wire form anchorage connector is the appropriate anchorage connector³ for the situation and work environment in which it will be used.

²Some of the other OSHA standards that have fall protection provisions include: 1910.66, 1910.132, 1910.268, 1910.269, Subpart D of the general industry standards, 1915.159, 1915.160, 1915.161, 1918.85, 1926.104, 1926.451(g), and 1926.760.

³Double locking devices - such as large snaphooks, rebar hooks, or pelican hooks and tie-back type shock-absorbing lanyards -- may be used in lieu of wire form anchorage connectors as components of the connection assembly for positioning device systems and personal fall arrest systems. However, as with wire form anchorage connectors, employers need to review the manufacturer's user instructions for these devices and only use the devices in a manner that conforms to the manufacturer's instructions and use limitations. In addition, employers must comply with OSHA regulations applicable to the use of such devices.