

Synthetic Fall Arrestors (Rope Grabs), Vertical Systems and CSA Z259.2.5-17

Connectors for Rope Grabs

As stated in CSA Z259.2.5-17 Fall arrestors and vertical lifelines, rope grab connector types and connector lengths have changed significantly. The design requirements are listed below.

Fall arresters meant for attachment to the harness dorsal D-Rings shall;

- 1) have integral connection to rope grabs,
- 2) be no longer than 750 mm (30 in.) (Z259.2.5-17, Section 4) and,
- 3) limit dynamic arresting forces to:
 - a) Average arresting force (AAF) of 6 kN
 - b) Maximum arresting force (MAF) of 8 kN

A popular user convention is to attach 1.8 m (6 ft.) energy absorbing lanyards to rope grabs in order to connect to the user's harness. Most manufacturers have historically limited this connector length to 0.9 m (3 ft.) or less to mitigate potential free fall to 1.8 m (6 ft.) or less.

When using 1.8 m (6 ft.) lanyards, rope grabs can travel below the user on the lifeline. Should a fall occur in this situation, a 3.6 m (12 ft.) free fall can occur. Lanyard energy absorbers and lifelines are not designed nor tested to these extremes and, as a result, may not adequately protect users from potential injury or death. CSA reduced the maximum connector lengths to 750 mm (30 in.) and permanently affix the connector to the rope grabs to mitigate this danger.

Arresting Forces

Dynamic performance testing has been updated in this most recent standard. Arresting forces are now recorded from the vertical lifeline anchorage in testing. Load cells, which measure forces, are located between vertical lifelines and anchorage points. Forces are therefore measured systemically and include any energy absorption provided by both rope stretch and energy absorber deployment. (Z259.2.5-17, Section 5.3.2). As mentioned previously, AAF is 6 kN maximum and allowable MAF is 8 kN maximum during testing. The fall arrestor shall arrest the fall within 1 m (39 in) of travel on the lifeline.

Previously, energy absorbers used with rope grabs were certified to CSA Z259.11 standard for energy absorbers and lanyards. This reference has been removed from the rope grab standard to limit confusion on the lanyard selection process. This change results in:

- 1) Rope grab user capacities are now guided by rope grab testing results and not by energy absorber stated capacity.
- 2) Rope grab and lifeline combinations are tested as a system and include rope stretch and must be paired in this way.

Vertical Lifeline Selection and Compatibility

In a second, common user convention, users often assume any rope can be used with rope grabs once original lifelines wear out as long as it meets the diameter requirements posted on the rope grab. Because lifeline ropes are now tested systemically with rope grabs, only those rope-types tested with specific rope grabs are allowed for use to maintain certification and performance integrity. Using other ropes that are not approved and tested with the specific rope grab may increase arresting forces, break or cause excessive rope grab slippage during an arrest and jeopardize user and system safety.

Lifelines are tested with devices for which they were intended to be used. This clause in the standard includes the following wording:

“If a fall arrester is approved for use by the manufacturer with more than one type of vertical lifeline, the fall arrester shall meet all applicable test requirements of this Standard when tested with each individual combination.” (Z259.2.5-17, Section 4.3.6)

A third user convention frequently seen is the tying of knots in vertical lifelines to provide active “stops” for rope grabs on lifelines. Lifeline length is then controlled by users for travel restraint purposes. There are inherent dangers associated with this practice. This user convention is not covered in the CSA Standard. Knot usage concerns are listed below:

- 1) Knots, bends, edges and falls all reduce maximum breaking strength. For example, the breaking strength of a given rope over a carabiner with a diameter of 10 mm is approximately 30 percent less than the maximum breaking strength.
- 2) Ropes can be damaged by knots. When knots are removed from lifelines, ropes retain the damage and it is not often visible to the eye. Should falls take place below these damaged areas, lifeline failure can occur.
- 3) Rope manufacturers and fall protection manufacturers do not test applications with rope grabs and knotted lifelines and therefore cannot predict how rope grabs will react with lifeline knots. It is therefore not an acceptable practice.

Rope Grabs for Travel Restraint

When rope grabs are used for travel restraint purposes, 3M Fall Protection strongly recommends a manually adjusted rope grab (rope adjuster) be used. Rope adjusters are used in combination with a lifeline, lanyard and a full body harness to restrain users from reaching fall hazards (like sloped or leading-edge roof work). No vertical free fall is allowed in travel restraint. Workers can manually adjust for various lifeline lengths based on distance from fall hazard. Users will be kept from fall hazards if users or competent persons establish safe distances and train workers in fall hazard recognition.

Automatic rope grabs (also known as traveling or trailing rope grabs) are not recommended for travel restraint. Some automatic rope grabs can be locked onto lifelines with locking cams or parking mechanisms. Both methods may pose hazards in travel restraint applications. Manually “Locked off” rope grabs can be jostled during user movement and become “unlocked” on lifelines. In this case, rope grabs are free to travel with user movement and may allow users to approach fall hazards. Rope grab parking features are designed to maintain rope grabs overhead when users work on ladders. Parking features too can be deactivated from unintended manipulation during user movements. This is most important when considering horizontal and sloped surfaces.

Snap Hooks for Rope Grabs

Energy absorbing connectors (lanyards) on rope grabs must maintain a fixed length of 750 mm (30") as specified in the CSA Standard. The reasons have been explained earlier in this document regarding free fall. Since rope grab lanyards are to be attached to the dorsal D-ring of a full body harness, required connecting hardware is limited to regular self-closing snap hooks. Larger rebar, ladder and scaffold hooks are not permitted on harness dorsal D-rings.

Self-retracting device (SRD) are not for use on rope grabs. Varying SRD length can cause free falls outside of rope grab capabilities as discussed earlier in this document. Integral lanyards on rope grabs will prevent SRD use on rope grabs in the future.

Conclusion

Fall arresters and lifelines are parts of a personal fall arrest or travel restraint system when used correctly. Users must read, understand and follow manufacturers instructions for each component or part of these complete systems.

