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9.0 SLINGS

9.1 SCOPE

This chapter applies to the fabrication, attachment, use, inspection, and maintenance of slings used for lifting purposes. The proper and safe use of slings is governed by the American Society of Mechanical Engineers (ASME) standards and the Occupational Safety and Health Administration (OSHA) regulations. This section implements required criteria from DOE/RL-92-36, and the following standards: ASME B30.9-2010-Slings, OSHA 29 CFR-1910.184 Slings, and OSHA 29 CFR-1926.251 Rigging Equipment for Material Handling. Slings are used in conjunction with lifting equipment described in other sections of this manual. This chapter implements the following criteria and the applicable national standards and/or federal specifications that are mandatory per ASME B30.9-2010-Slings as follows:

- Chapter 9-1 Alloy Steel Chain Slings
- Chapter 9-2 Wire Rope Slings
- Chapter 9-3 Metal Mesh Slings
- Chapter 9-4 Synthetic Rope Slings
- Chapter 9-5 Synthetic Webbing Slings
- Chapter 9-6 Synthetic Round Slings

Each chapter above includes the following sections:

- Materials and Components
- Fabrication and Configurations
- Design Factor
- Rated Load
- Proof Test Requirements
- Sling Identification
- Effects of Environment
- Inspection, Removal and Repair
- Operating Practices

9.2 GENERAL REQUIREMENTS

Contractors shall access ASME via one of the following options:

1. IHS Engineering Standards, Regulations and Technical Specifications at <http://www.ihs.com/>. The contractor must have paid for access to the specific standard. For access contact The Hanford Technical Library, 277 University Dr, Richland, WA (372-7430). To print IHS file go to <http://www.ihs.com/>
2. To purchase standards directly from ASME go to <http://www.asme.org>
3. To access OSHA standards go to the following links:

- 29 CFR-1910.184 Slings
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9834
- 29 CFR-1926.251 Rigging Equipment for Material Handling
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10686

9.3 IMPLEMENTATION

Contractors shall be compliant to OSHA, ASME, DOE/RL-92-36 and the Slings manufacturers' requirements. It is the responsibility of the user of this manual to implement all of the requirements from listed sources. When two standards set forth inconsistent requirements, the user shall adhere to the standard containing the most stringent requirements. ASME standards provide the most comprehensive information. Users should contact a Hanford Hoisting Rigging Committee (HHRC) representative or send an email to ^Hanford Hoisting and Rigging for a formal interpretation. See Chapter 17.0 for process to be followed when requesting an interpretation. Notify the Hanford Site Hoisting and Rigging Committee if any inconsistent standards are identified.

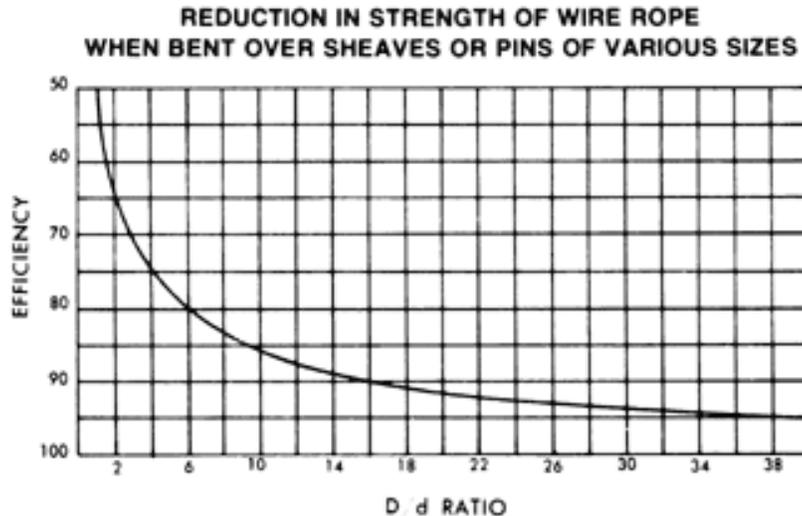
It is not the intent of this manual to require retrofitting of existing equipment. However, when any hoisting or rigging equipment is modified, its performance requirements shall be reviewed relative to the requirements within the current manual. The need to meet the current requirements shall be evaluated by a qualified person selected by the owner (user).

9.4 INCONSISTENT STANDARDS

OSHA 29 CFR 1910.184 Table N-184-4 specifies deductions from capacities shall be taken if a D/d ratio of 20:1 or greater for 6 x 36 and 6 x 19 Improved Plow Steel Grade Wire Rope with an IWRC is not maintained. ASME B30.9-2010 specifies deductions from capacities shall be taken on a mechanical spliced sling if a D/d ratio of 25:1 or less is obtained for 6 x 36 and 6 x 19 Extra Improved Plow Steel Grade Wire Rope with an IWRC.

Therefore, the requirements of the more restrictive ASME B30.9-2010 shall be followed, but in no case shall wire rope slings be subjected to a D/d ratio of less than 1:1.

9.4.1 D/d Ratio



When a wire rope is bent around any sheave or other object there is a loss of strength due to this bending action. As the D/d ratio becomes smaller this loss of strength becomes greater and the rope becomes less efficient. This curve relates the efficiency of a rope diameter to different D/d ratios. This curve is based on static loads and applies to 6-strand class 6x19 and 6x37 wire rope.

Effects on Wire Rope Slings

The D/d Ratio is the ratio of the diameter around which the sling is bent divided by the body diameter of the sling. Example: A 1/2" diameter wire rope is bent around a 10" diameter pipe; the D/d Ratio is 10" divided by 1/2" = D/d Ratio of 20:1 This ratio has an effect on the rated capacity of slings.

9.5 HANFORD SPECIFIC REQUIREMENTS AND PRACTICES

9.5.1 Prohibited Sling Applications

Slings with eyes formed by folding back the rope (not a Flemish eye loop) and secured with one or more metal sleeves pressed (not forging) over the wire rope junction are prohibited for lifting service.

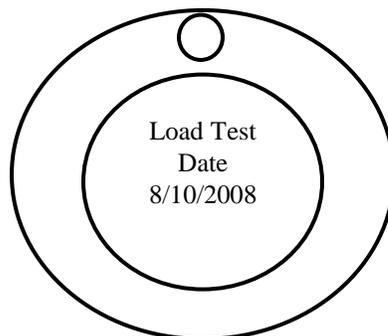
9.5.1.1 Pre-Use Inspections

Prior to use, slings shall be inspected and verified that the periodic inspection is current.

9.5.2 Inspection and Testing Documentation

9.5.2.1 Proof Testing

All slings shall be proof tested (load tested) prior to initial use by the manufacturer or user. Proof test date shall be marked on the sling. Proof test shall never be less than minimum requirements defined in ASME B30.9-2010. A tag indicating date of load test may be affixed to the device for filed verification. See example in Figure 9-1.

Figure 9-1 – Example of a Load Test Tag

9.5.3 Periodic Inspections

The periodic inspection for all sling types used at Hanford shall be documented by any one of the following methods:

1. Mark a serial number on the sling and maintain inspection records by serial numbers.
2. Institute a comprehensive marking program (such as color coding) to indicate when the next inspection is required.
3. Mark each sling with a tag that indicates when the next periodic inspection is required. This tag becomes the record.

9.5.4 Periodic Inspection Record Tags

A periodic inspection tag (like the example shown below) is required in addition to the other sling identification requirements for each sling type prescribed by the applicable ASME B30.9-2010 chapter.

Figure 9-2 Example of Periodic Inspection Tag