

## Chapter 26-4

# Links, Master Link Subassemblies, Rings, and Swivels

### SECTION 26-4.0: SCOPE

This Chapter applies to links, master link subassemblies, rings, and swivels.

### SECTION 26-4.1: TYPES AND MATERIALS

#### 26-4.1.1 Types

(a) Links, master link subassemblies, and rings, including oblong, round and pear shapes (see Fig. 26-4.1.1-1).

(b) Swivels, including eye-and-eye and eye-and-jaw types used for positioning (see Fig. 26-4.1.1-2).

(c) Links, master link subassemblies, rings, and swivels other than those detailed in this Chapter shall be used only in accordance with recommendations of the manufacturer or a qualified person.

#### 26-4.1.2 Materials

Links, master link subassemblies, rings, and swivels shall have sufficient ductility to permanently deform before losing the ability to support the load at the temperatures the manufacturer has specified for use.

#### SECTION 26-4.2: DESIGN FACTOR

The design factor for links, master link subassemblies, rings, and swivels shall be a minimum of 5.

#### SECTION 26-4.3: RATED LOADS

Rated load shall be in accordance with the recommendation of the link, master link subassembly, ring, or swivel manufacturer. The terms *rated capacity* and *working load limit* are commonly used to describe rated load.

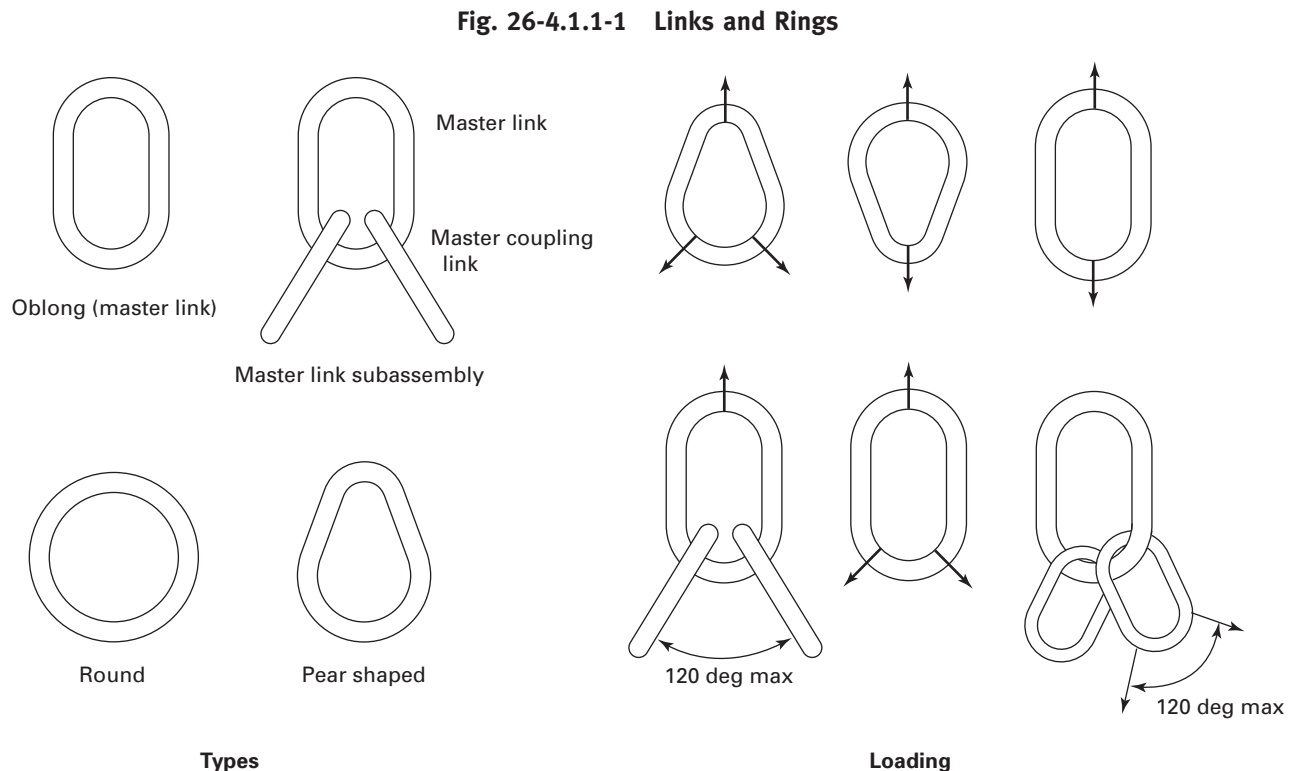
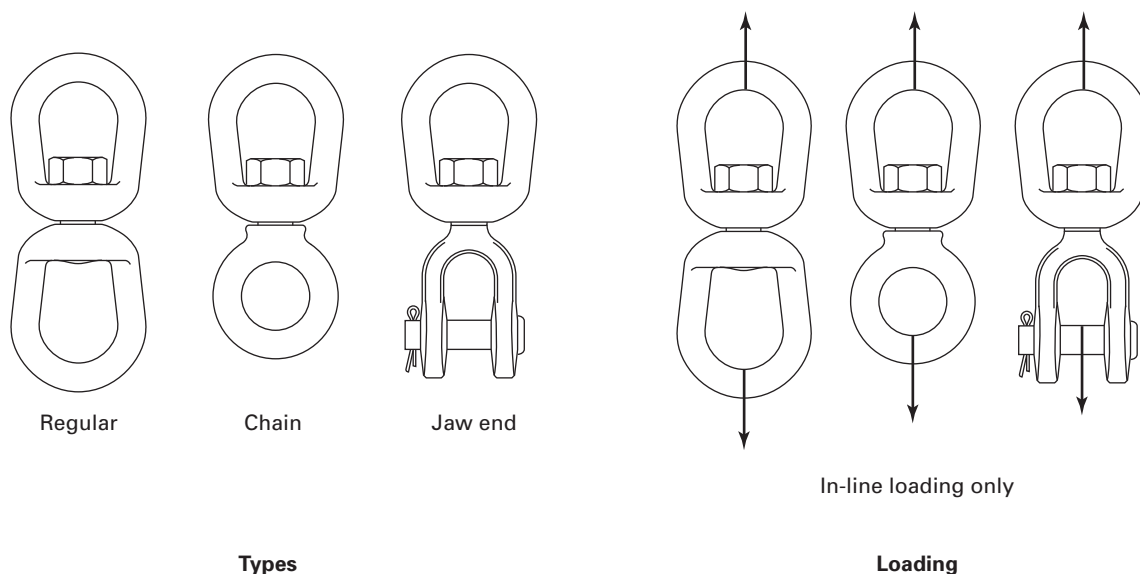


Fig. 26-4.1.1-2 Swivels



## SECTION 26-4.4: PROOF TEST

### 26-4.4.1 Proof Test Requirements

(a) Prior to initial use, welded links, welded rings, and master link subassemblies shall be proof tested by the manufacturer or a qualified person.

(b) All other links, rings, and swivels are not required to be proof tested unless specified by the purchaser.

(c) Proof tested links, master link subassemblies, rings, and swivels shall be inspected after the test for the conditions stated in para. 26-4.8.5.

### 26-4.4.2 Proof Load Requirements

(a) The proof load for links, rings, and swivels shall be a minimum of 2 times the rated load.

(b) The proof load for master link subassemblies are

- (1) each master coupling link shall be tested at the rated load of the master link subassembly
- (2) the master link shall be tested at 2 times the rated load of the master link subassembly

## SECTION 26-4.5: IDENTIFICATION

### 26-4.5.1 Links, Master Link Subassemblies, Rings, and Swivels Identification

Each link, master link subassembly, ring, and swivel shall be durably marked by the manufacturer to show

- (a) name or trademark of manufacturer
- (b) size or rated load
- (c) grade, if required to identify rated load

### 26-4.5.2 Maintenance of Identification

Link, master link subassembly, ring, and swivel identification should be maintained by the user so as to be legible throughout the life of the hardware.

## SECTION 26-4.6: EFFECTS OF ENVIRONMENT

### 26-4.6.1 Temperature

(a) When steel links, master link subassemblies, rings, or swivels are to be used at temperatures above 400°F (204°C) or below -40°F (-40°C), the link, master link subassembly, ring, and swivel manufacturer or a qualified person should be consulted.

(b) For links, master link subassemblies, rings, or swivels made from other materials, consult the manufacturer or a qualified person.

### 26-4.6.2 Chemically Active Environments

The strength of links, master link subassemblies, rings, and swivels can be affected by chemically active environments, such as caustic or acidic substances or fumes. The link, master link subassembly, ring, or swivel manufacturer or a qualified person shall be consulted before use in chemically active environments.

## SECTION 26-4.7: TRAINING

Link, master link subassembly, ring, and swivel users shall be trained in the selection, inspection, cautions to personnel, effects of environment, and rigging practices as covered by this Chapter.

## SECTION 26-4.8: INSPECTION, REPAIR, AND REMOVAL

### 26-4.8.1 General

All inspections shall be performed by a designated person. Any deficiencies identified shall be examined and a determination made by a qualified person as to whether they constitute a hazard.

### 26-4.8.2 Initial Inspection

Prior to use, all new, altered, modified, or repaired links, master link subassemblies, rings, and swivels shall be inspected to verify compliance with the applicable provisions of this Chapter. Written records are not required.

### 26-4.8.3 Frequent Inspection

(a) A visual inspection shall be performed each shift before the links, master link subassemblies, rings, and swivels are used. Rigging hardware in semi-permanent and inaccessible locations where frequent inspections are not feasible shall have periodic inspections performed.

(b) Conditions such as those listed in para. 26-4.8.5, or any other condition that may result in a hazard, shall cause the hardware to be removed from service. Links, master link subassemblies, rings, and swivels shall not be returned to service until approved by a qualified person.

(c) Written records are not required.

### 26-4.8.4 Periodic Inspection

(a) A complete inspection of the links, master link subassemblies, rings, and swivels shall be performed. The hardware shall be examined for conditions such as those listed in para. 26-4.8.5 and a determination made as to whether they constitute a hazard.

(b) *Periodic Inspection Frequency*

(1) Periodic inspection intervals shall not exceed 1 yr. The frequency of periodic inspections should be based on

- (-a) frequency of use
- (-b) severity of service conditions
- (-c) nature of lifting or load handling activities
- (-d) experience gained on the service life of hardware used in similar circumstances

(2) Guidelines for the time intervals are

- (-a) normal service — yearly
- (-b) severe service — monthly to quarterly
- (-c) special service — as recommended by a qualified person

(c) Written records are not required.

### 26-4.8.5 Removal Criteria

Links, master link subassemblies, rings, and swivels shall be removed from service if conditions such as the

following are present and shall only be returned to service when approved by a qualified person:

- (a) missing or illegible identification
- (b) indications of heat damage, including weld spatter or arc strikes
- (c) excessive pitting or corrosion
- (d) bent, twisted, distorted, stretched, elongated, cracked, or broken load-bearing components
- (e) excessive nicks or gouges
- (f) a 10% reduction of the original or catalog dimension at any point
- (g) evidence of unauthorized welding or modification
- (h) for swivels, lack of the ability to freely rotate when not loaded
- (i) for swivels, loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices
- (j) other conditions, including visible damage that cause doubt as to continued use

### 26-4.8.6 Repairs and Modifications

(a) Repairs, alterations, or modifications shall be as specified by the link, master link subassembly, ring, or swivel manufacturer or a qualified person.

(b) Replacement parts shall meet or exceed the original equipment manufacturer's specifications.

## SECTION 26-4.9: OPERATING PRACTICES

### 26-4.9.1 Links, Master Link Subassemblies, Rings, and Swivels Selection

(a) Links, master link subassemblies, rings, and swivels having suitable characteristics for the type of load, hitch, angle of loading, and environment shall be selected in accordance with the recommendations of the hardware manufacturer or a qualified person.

NOTE: The angle of loading affects the load on the links, master link subassemblies, rings, and swivels. As the horizontal angle decreases, the effective load increases (see Fig. 26-4.9.1-1).

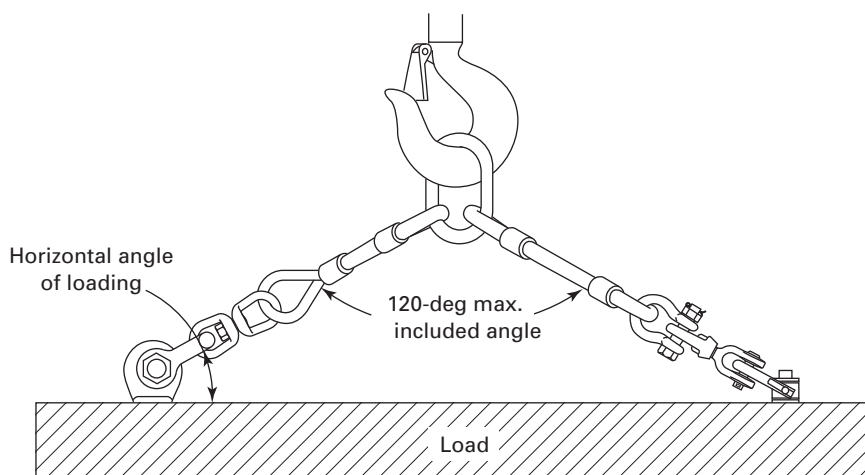
(b) The rated load of the links, master link subassemblies, rings, and swivels shall not be exceeded.

(c) Links, master link subassemblies, rings, and swivels that appear to be damaged shall not be used until inspected and accepted as usable under para. 26-4.8.

### 26-4.9.2 Cautions to Personnel

(a) All portions of the human body shall be kept from between the links, master link subassemblies, rings, and swivels, the load, and any other rigging during lifting or load handling activities.

(b) Personnel should stand clear of the suspended load.

(15) **Fig. 26-4.9.1-1 Angle of Loading (Links, Master Link Subassemblies, Rings, and Swivels)**

Horizontal Angle, deg	Stress Multiplier
90	1.000
60	1.155
45	1.414
30	2.000

(c) Personnel should stand clear of rigging when it is under tension.

(d) Personnel shall not ride links, master link subassemblies, rings, and swivels.

### 26-4.9.3 Storage and Work Environments

(a) Links, master link subassemblies, rings, and swivels should be stored in an area where they will not be subjected to damage, corrosive action, or extreme temperatures.

(b) If extreme temperatures or chemically active environments are involved, the guidance provided in para. 26-4.6.1 or 26-4.6.2 shall be followed.

### 26-4.9.4 Rigging Practices

#### 26-4.9.4.1 Links and Rings

(a) Alterations or modifications shall comply with para. 26-4.8.6(a).

(b) Contact with obstructions that could damage the link or ring should be avoided.

(c) Shock loading should be avoided.

(d) Links and rings should not be dragged on an abrasive surface.

(e) The link or ring shall be of the proper shape and size to ensure that it seats properly in the hook, lifting device, or rigging hardware.

(f) Multiple slings or rigging hardware gathered in a link or ring shall not exceed a 120-deg included angle, unless approved by a qualified person (see Fig. 26-4.9.1-1).

(g) The horizontal angle of loading shall not be less than 30 deg, unless approved by a qualified person (see Fig. 26-4.9.1-1).

#### 26-4.9.4.2 Master Link Subassemblies

(a) Alterations or modifications shall comply with para. 26-4.8.6(a).

(b) Contact with obstructions that could damage the master link subassembly should be avoided.

(c) Shock loading should be avoided.

(d) Master link subassembly should not be dragged on an abrasive surface.

(e) The master link subassembly shall be of the proper shape and size to ensure that it seats properly in the hook, lifting device, or rigging hardware.

(f) Multiple slings or rigging hardware gathered in a master coupling link shall not exceed a 120-deg included angle, unless approved by a qualified person (see Fig. 26-4.1.1-1).

(g) The master coupling links gathered in a master link shall not exceed a 120-deg included angle, unless approved by a qualified person (see Fig. 26-4.1.1-1).

(h) The horizontal angle of loading shall not be less than 30 deg, unless approved by a qualified person (see Fig. 26-4.9.1-1).

(i) Nonsymmetrical loads require an analysis by a qualified person to prevent overloading of any master coupling link.

(j) No single component shall be overloaded.

#### 26-4.9.4.3 Swivels

(a) Swivels are positioning hardware and are not intended to be rotated under load.

(b) Swivels shall only be used for in-line loads (see Fig. 26-4.1.1-2).

(c) Components shall be maintained in good working condition.

(d) Alterations or modifications shall comply with para. 26-4.8.6(a).

(e) Shock loading should be avoided.

(f) Swivels shall be of the proper shape and size to ensure that they seat properly in the hook, lifting device, or rigging hardware.

(g) Contact with obstructions that could damage the swivel should be avoided.