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# CHAPTER 13

## LOAD HOOKS

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This chapter provides safety standards for the inspection, testing, and maintenance of load hooks installed on cranes or hoists and implements the requirements of ASME B30.10, Chapter 10-1, “Hooks.” See Chapter 12, “Rigging Accessories,” for rigging hook requirements.

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## 13.1 GENERAL

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### 13.1.1 Marking

The manufacturer's identification shall be forged, cast, or die-stamped on a low-stress and nonwearing area of the hook.

### 13.1.2 Attachments

- a. Hoisting hooks shall be fitted with a latch to bridge the throat opening to prevent the accidental release of slings or attachments. Hooks without latches may be used in special applications where the latch would interfere with the proper use of the hook, providing that (1) the use of the hook is restricted to the application for which it is approved, and (2) in questionable cases, concurrence is obtained from the appropriate safety organization.
- b. If a handle or latch support whose design requires heat-treating is welded to the hook, welding shall be done prior to final heat-treating.

### 13.1.3 Load Limits

Hooks shall not be loaded beyond rated capacity except during load tests of the equipment of which they are a part.

### 13.1.4 Hook Standards

- a. Hook design shall meet generally accepted hook design standards and be compatible with the requirements of ASME B30.10.
- b. The hook material shall have sufficient ductility to permanently deform before failure at the ambient temperatures at which the hook will be used.
- c. When a latch is provided, it shall be designed to retain such items as slings under slack conditions. The latch is not intended to support the load.
- d. The bearing surfaces of new hooks shall be the arc of a circle. Gauge points, or hook gauges, for measuring spread after load testing should be provided.
- e. Field-fabricated hooks shall meet the requirements of this section and shall be approved by the cognizant engineering and safety organizations.

## 13.2 INSPECTIONS

### 13.2.1 Hook Service

Hook service is defined as follows:

- a. Normal service—operation at less than 85 percent of rated capacity except for isolated instances.
- b. Heavy service—operation at 85 to 100 percent of rated capacity as a regular specified procedure.
- c. Severe service—operation at heavy service coupled with abnormal operating conditions, (i.e., extreme temperatures, corrosive atmospheres, etc.)

### 13.2.2 Initial Inspection

- a. Prior to initial use, all new and repaired hooks shall be inspected by a qualified inspector to ensure their compliance with the applicable provisions of ASME B30.10 Section 10-1.2. Dated and signed inspection records shall be kept on file and shall be readily available.
- b. Inspection procedure and record keeping requirements for hooks in regular service shall be governed by requirements for the kind of equipment in which they are used. When such requirements are stated in standards for the specific equipment, they shall take precedence over the requirements of this section.

### 13.2.3 Daily Inspection

- a. Operators or other designated personnel shall visually inspect hooks for deficiencies such as the following each day or prior to use if the hook has not been in regular service (records are not required):
  1. Cracks, nicks, and gouges.
  2. Deformation.
  3. Damage from chemicals.
  4. Latch engagement, damage to or malfunction of latch (if provided).
  5. Evidence of heat damage.

- b. A designated person shall examine deficiencies and determine whether they constitute a safety hazard and whether a more detailed inspection is required.

### 13.2.4 Frequent Inspection

- a. Operators or other designated personnel shall visually inspect the hook at the following intervals (records are not required) :
  1. Normal service—monthly. Operation at less than 85 percent of rated capacity except for isolated instances.
  2. Heavy service—weekly to monthly. Operation at 85 to 100 percent of rated capacity as a regular specified procedure.
  3. Severe service—daily to weekly. Operation at heavy service coupled with abnormal operating conditions, (i.e., extreme temperatures, corrosive atmospheres, etc.)
- b. These inspections shall, in addition to the requirements of Section 13.2.3, “Daily Inspection,” include the following:
  1. Wear.
  2. Hook attachment and securing means.

- c. A designated person shall examine deficiencies and determine whether they constitute a safety hazard and whether a more detailed inspection is required.

### 13.2.5 Periodic Inspection

- a. A qualified inspector shall perform a complete inspection at the following intervals:
  1. Normal service—yearly.
  2. Heavy service—semiannually.
  3. Severe service—quarterly.
- b. A designated person shall examine deficiencies and determine whether they constitute a safety hazard.
- c. The inspection shall include the

requirements of Section 13.2.4, “Frequent Inspection.”

d. Hooks shall receive a nondestructive test (NDT) according to Section 13.4, “Nondestructive Testing.”

e. Hooks having any of the following conditions shall be removed from service until repaired or replaced:

1. *Deformation*—Any bending or twisting exceeding 10° (or as recommended by the manufacturer) from the plane of the unbent hook.

2. *Throat opening*—Any distortion causing an increase in throat opening exceeding 15 percent (or as recommended by the manufacturer).

3. *Wear*—Any wear exceeding 10 percent (or as recommended by the manufacturer) of the original section dimension of the hook or its load pin.

4. Cracks.

5. If a latch is provided and it becomes inoperative because of wear or deformation or fails to fully bridge the throat opening, the hook shall be removed from service until the device has been repaired or replaced and the throat opening has been assessed as described above.

f. If hooks are painted, a visual inspection should take the coating into consideration. Surface variations can disclose evidence of heavy or severe service. The surface condition may call for stripping the paint in such instances.

g. Dated and signed inspection records shall be kept on file and shall be readily available.

h. A sample load test and inspection form is included as Exhibit I in Chapter 12, “Rigging Accessories.” This form is intended to be a sample only and is not intended to be mandatory.

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## 13.3 TESTING

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- a. Each hook of 150-ton capacity or greater and a prototype of each hook design of less than 150-ton capacity shall be proof-tested by the manufacturer in accordance with Table 13-1.
- b. When proof tests are used, the hooks shall withstand the proof load application without permanent deformation when the load is applied for a minimum of 15 sec. This condition is considered satisfied if the permanent increase in the throat opening does not exceed 0.5 percent or 0.01 in. (0.25 mm), whichever is greater.
- c. For a duplex (sister) hook having a pin eye, the proof load for the eye shall be in accordance with Table 13-1. The proof load shall be shared equally between the two prongs of a sister hook, unless the hook is designed for unbalanced loading.
- d. Hooks that have been proof-tested shall be inspected by the magnetic-particle method in accordance with ASTM E-709 ("Standard Practice for Magnetic Particle Examination") and shall show no cracks, inclusions, or other relevant discrepancies; castings shall be evaluated in accordance with ASTM E-165 ("Standard Practice for Liquid Penetrant Inspection Method.")
- e. No performance testing of hooks shall be required, except as is necessary to conform to the requirements for the equipment of which they are a part.

Table 13-1. Proof test load.

Rated load,		% rated load	Proof load (minimum),	
tons (2,000 lb)	kg		tons (2,000 lb)	kg
0.50	453.6	200	1	907.2
1	907.2	200	2	1,814.4
5	4,536	200	10	9,072
10	9,072	200	20	18,144
15	13,608	200	30	27,216
20	18,144	200	40	36,288
25	22,680	200	50	45,360
30	27,216	200	60	54,432
35	31,752	200	70	63,504
40	36,288	200	80	72,576
45	40,824	200	90	81,648
50	45,360	200	100	90,720
60	54,432	193	116	105,235
75	68,040	183	137	124,286
100	90,720	166	166	150,595
125	113,400	150	188	170,554
150	136,080	133	200	181,440
175	158,760	133	233	211,378
200	181,440	133	266	241,315
250	226,800	133	333	302,098
300	272,160	133	399	361,973
350	317,520	133	465	421,848
400	362,880	133	532	482,630
450	408,240	133	598	542,506
500	453,600	133	665	603,288
Above 500	453,600	133		

Note: 1 ton (short, 2,000 lb) = 907.2 kg

For hooks with load ratings not shown above, use the next lower load rating for determining the percent of rated load to be applied.

## 13.4 NONDESTRUCTIVE TESTING (NDT)

### 13.4.1 NDT Requirements

a. For crane and hoist hooks of 10-ton rated capacity or greater that are assigned to heavy or severe service, a qualified inspector shall perform an NDT at the following intervals:

1. Heavy service: annually.
2. Severe service: semiannually.

b. A designated person or a qualified inspector shall perform an NDT for other hooks when deemed necessary for site-specific reasons.

c. If visual examination reveals a surface intersecting discontinuity (i.e., stress or fatigue cracks), a twist, increased throat opening, or any other defect, an NDT shall be performed to evaluate the hook further, regardless of its rated capacity or service classification.

### 13.4.2 NDT Records

Dated and signed NDT records, traceable to the hook by a serial number or other identifier, shall be kept on file as long as the hook remains in service and shall be readily available to appointed personnel.

### 13.4.3 NDT Methods

a. Use magnetic-particle testing or liquid-penetrant testing methods to inspect for surface intersecting discontinuities.

b. A qualified inspector or designated person shall perform NDTs in accordance with the following ASTM standards:

1. ASTM E-709.
2. ASTM E-165.

c. For magnetic-particle testing, a coil, yoke, or wet technique should be used to eliminate the

possibility of prod burns or arc strikes.

d. Perform an NDT with the hook in place unless conditions indicate that disassembly for thread or shank inspection is necessary.

### 13.4.4 Acceptance Criteria

A designated person shall document and resolve the following relevant indications:

- a. Arc strikes (welding or electrical).
- b. Surface intersecting discontinuities 0.25 in. long or longer.

### 13.4.5 Discontinuity Removal

a. Two directions of discontinuity, “P” and “T,” are shown on Figures 13-1 and 13-2. Discontinuity “P” parallels the contour of the hook, is considered nonserious, and does not require removal. Discontinuity “T,” on the other hand, is transverse to the contour of the hook and is more serious; when occurring in zones B, C, or D, discontinuity “T” may reduce the longevity of the hook.

b. Discontinuities may be removed by grinding longitudinally following the contour of the hook to produce a smooth, gently undulating surface. In zones B and D, such grinding shall not reduce the original hook dimension by more than 10 percent. Such a reduction will not affect the working load limit rating or the ultimate load rating of the hook. In zone C, grinding shall not reduce the original dimension by more than 5 percent.

c. Under normal and proper application, zone A is an unstressed zone. Therefore, it is not required that discontinuities in that zone be ground out.

d. The hook shall be reexamined by performing an NDT after grinding to verify removal of relevant discontinuities.

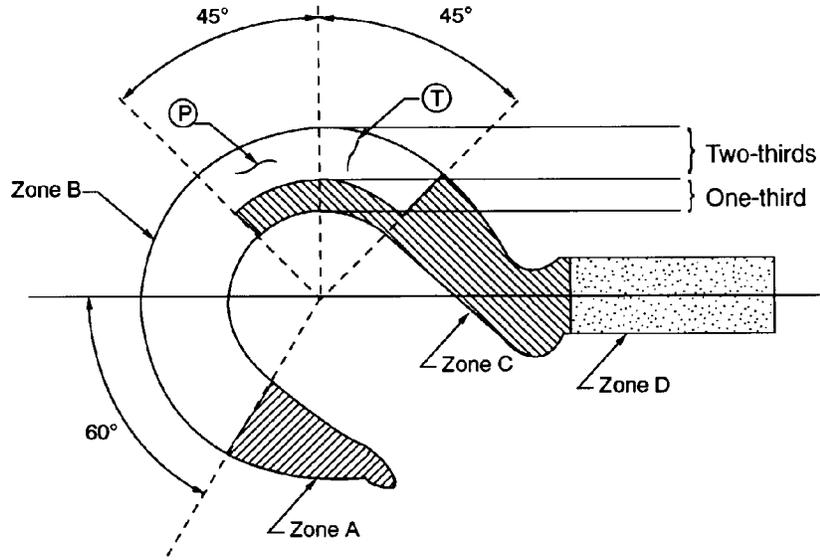


Figure 13-1. Shank hook.

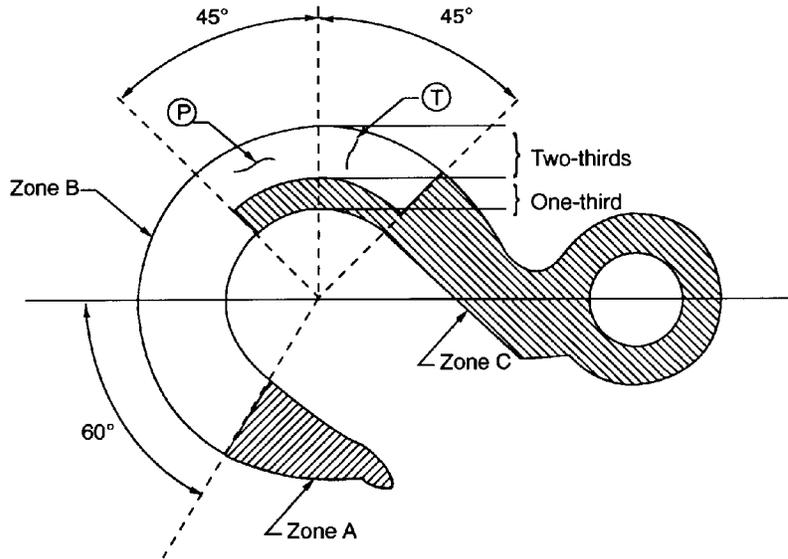


Figure 13-2. Eye hook.

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## 13.5 MAINTENANCE

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- a. A hook latch that is inoperative or missing shall be replaced.
- b. A hook with a latch that does not bridge the throat opening shall be removed from service until the latch is replaced or repaired and the hook is examined for deformation with special attention to the throat opening.
- c. A designated person shall repair cracks, nicks, and gouges by grinding longitudinally, following the contour of the hook, provided no dimension is reduced more than 10 percent (or as recommended by the manufacturer) of its original value.
- d. All other repairs shall be performed by the manufacturer or a qualified person.

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## 13.6 OPERATION

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Hook users shall do the following:

- a. Determine that the weight of the load to be lifted does not exceed the load rating of the hook.
- b. Avoid shock loading.
- c. Center the load in the base (bowl or saddle) of the hook to prevent point loading of the hook.
- d. Do not use hooks in such a manner as to place a side- or backload on the hook.
- e. When using a device to bridge the throat opening of the hook, ensure that no portion of the load is carried by the bridging device.
- f. Keep hands and fingers from between the hook and the load.
- g. Load duplex (sister) hooks equally on both sides, unless the hook is specifically designed for single loading.
- h. Do not load the pinhole in duplex (sister) hooks beyond the rated load of the hook.