ASME HST-3-20XX PERFORMANCE STANDARD FOR LEVER HOISTS

Note that additions are shown in blue with underline (example) and deletions shown in red with strikethrough (example).

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Chapter 3-0
Scope, Definitions, References, and Appendix

SECTION 3-0.1 SCOPE
(a) This Standard establishes performance requirements for chain, wire rope, and web strap lever hoists for lifting, pulling, and tensioning applications (see Figures 3-0.1-1, 3-0.1-2, 3-0.1-3, and 3-0.1-4).
(b) The specifications and information in this Standard apply to lever hoists of the following types:
   (1) ratchet-and-pawl operation with
       - (a) roller-type load chain lifting medium
       - (b) welded-link-type load chain lifting medium
       - (c) web-strap-type lifting medium
       - (d) wire-rope-type lifting medium
   (2) friction-brake operation with
       - (a) roller-type load chain
       - (b) welded-link-type load chain
       - (c) web-strap-type lifting medium
       - (d) wire-rope-type lifting medium
   (c) Specially insulated lever hoists designed for handling high-voltage lines are not covered by this Standard.
   (d) This Standard is applicable to hoists manufactured after the date on which this Standard is issued.
   This Standard is not applicable to
   (1) damaged or malfunctioning hoists
   (2) hoists that have been misused or abused
   (3) hoists that have been altered without authorization of the manufacturer or a qualified person
   (4) hoists used for lifting or supporting people
   (5) hoists used for the purpose of drawing both the load and hoist up or down the hoist's own load chain(s), wire rope(s), or web strap(s)
   (6) hoists used for marine and other applications as required by the Department of Defense (DOD) unless Non-mandatory Appendix A has been invoked.

The requirements of this Standard shall be applied together with the requirements of ASME B30.21. Refer to ASME B30.21 for requirements pertaining to marking, construction, installation, inspection, testing, maintenance, and operation.

SECTION 3-0.2 DEFINITIONS
abnormal operating conditions: environmental conditions that are unfavorable, harmful, or detrimental to the operation of a hoist, such as excessively high or low ambient temperature, exposure to weather, corrosive fumes, dust-laden or moisture-laden atmospheres, and hazardous locations.
brace: a device for retarding and stopping motion of the load (see load-controlling mechanism).
hazardous (classified) locations: locations where fire or explosion hazards may exist. Locations are classified according to the properties of the flammable vapors, liquids, gases, or combustible dust or fibers that may be present, and the likelihood that a flammable or combustible concentration or quantity is present. Refer to ANSI/ NFPA 70.
headroom (closed height): the distance between the saddle of the suspension hook and the saddle of the load hook when the load hook is in its fully retracted position (see Figure 3-0.1-1).
idler sprocket: a freely rotating device that changes the direction of the load chain, rope, or web strap.
lever hoist: a manually lever-operated device used to lift, lower, or pull a load and to apply or release tension.
lever pull: the average force, lbf (kN), exerted by the operator at the end of the operating lever (handle) to lift or pull rated load.
lift: the maximum distance through which the load hook can travel (see Figure 3-0.1-1).
lifting devices: devices that are not normally reeved onto the hoist rope, web strap, or chain, such as supplemental devices used for handling or attaching to the load. The weight of these devices is to be considered part of the load to be lifted.
lifting medium: the chain, wire rope, or web strap used by the lever hoist to apply a force or support the load.
**load**: the total superimposed force on the hoist load block or load hook, including lifting devices.

**load block**: the assembly of hook or shackle, swivel, bearings, sheaves, sprockets, pins, and frame suspended by the load chain, rope, or web strap. This shall include any appurtenances reeved into the load chain, rope, or web strap.

**load chain**: the load-bearing chain in the hoist.

**roller chain**: a series of alternately assembled roller links and pin links in which pins articulate inside the bushings, and rollers are free to turn on the bushings. Pins and bushings are press-fit in their respective link plates.

**load controlling mechanism**: a mechanism that functions automatically to hold and control the load. In each of the following general types, a reciprocating force must be applied to the hoist lever to lower the load:

- **friction-brake type**: an automatic type of brake used for holding and controlling loads. This unidirectional device requires a force applied to the operating lever to lower the load but does not impose additional lever pull when lifting the load.
- **ratchet-and-pawl type**: a load-controlling mechanism consisting of interlocking pawl(s) and ratchet that act to hold the load by mechanical engagement.

**load hook**: the hook used to connect the load to the hoist.

**load suspension parts**: the suspension hook, the chain, rope or web strap, the sprocket(s), the structure or housing that supports the sprocket(s), and the load block.

**welded-link chain**: a chain consisting of interwoven links formed and welded.

NOTE: Load-chain properties do not conform to those shown in ASME B30.9.

**normal operating conditions**: conditions during which a hoist is performing functions within the scope of the original design.

**operating lever**: the lever or handle provided to operate the hoist.

**overload**: any load greater than the rated load.

**pawl**: a device that engages the ratchet to prevent rotation.

**qualified person**: a person who, by possession of a recognized degree in an applicable field or a certificate of professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.
ratchet: a toothed member that engages with a pawl.

rated load (capacity): the maximum load designated that shall be applied to the hoist as specified by the manufacturer or qualified person. For which a hoist is designed and built.

reach (extended height): the distance from the saddle of the load hook at its fully extended position (lower limit of travel) to the saddle of the suspension hook. Reach is equal to lift plus headroom (see Figure 3-0.1-1).

reeving: a system in which the chain, rope, or web strap travels around sprockets (drums) and sheaves (see Figure 3-0.1-1).

shall: a word indicating used to denote indicates a requirement.
sheave: a grooved wheel or pulley used with a chain, rope, or web strap to change the direction and point of application of a pulling force.

should: a word indicating is used to denote indicates a recommendation.

side pull: any force or operating condition that restricts the load block, chain, rope, or web strap, and hoist body from forming a straight line with the direction of loading.

suspension hook: the hook attached to the body of the hoist.

web strap: a fabric woven of high-tenacity synthetic yarns.

SECTION 3-0.3 REFERENCES

The following documents form a part of this Standard to the extent specified herein. The latest edition shall apply.

ANSI Z535.4, Product Safety Signs and Labels
Publisher: National Electrical Manufacturers Association (NEMA), 1300 North 17th Street, Rosslyn, VA 22209 (www.nema.org)

ANSI/NFPA 70, National Electrical Code
Publisher: National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169 (www.nfpa.org)

ASME B30.9, Slings
ASME B30.21, Lever Hoists
Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016 (www.asme.org)
SECTION 3-0.4  APPENDICES

Nonmandatory Appendix A applies to the performance requirements for hoists used in marine and other applications. The requirements in Nonmandatory Appendix A are in addition to the requirements of ASME HST-3 and ASME B30.21 and must be separately invoked.

Nonmandatory Appendix B, Mechanical Spark Resistance Guidance for Applications in Hazardous (Potentially Explosive) Locations, applies to hoists used in locations defined as hazardous (potentially explosive) locations. The guidance provided in Nonmandatory Appendix B is in addition to the requirements of ASME HST-3.
Chapter 3-1
Performance

SECTION 3-1.1 GENERAL

All equipment selected in accordance with this Standard shall perform satisfactorily when used in accordance with ASME B30.21, Chapters 21-2 through 21-4 and used within the rated load.

All equipment shall provide for operating lever pull, lift, and headroom in accordance with the manufacturer's specifications or the specifications agreed upon by the manufacturer and user.

SECTION 3-1.2 APPLICATION

Lever hoists shall be suitable for lifting or lowering, pulling or tensioning loads within their rated load. They shall be capable of being used in pulling or tensioning applications at any angle, provided the load block, lifting medium, and hoist body are not restricted from forming a straight line with the direction of loading.

The hoists covered by this Standard are intended for industrial use in ambient temperatures from 0°F to 130°F (−18°C to 54°C) and should perform satisfactorily when applied and operated in the manner described in this Standard. The user should consult with the manufacturer for lever hoists to be used in hazardous (classified) locations or under abnormal operating conditions. Refer to ASME B30.21 for construction, installation, inspection, testing, operation, and maintenance.

Because of varying environmental conditions, loading, and usage, the hoist service life is interrelated to the type and frequency of maintenance performed on the unit.

Equipment covered by this Standard should be inspected and maintained according to ASME B30.21, Chapter 21-4.

For Applications in Hazardous (Potentially Explosive) Locations, Nonmandatory Appendix B provides guidance for both the manufacturer and the end user to assist in configuring a hoist to make it suitable for use in a potentially explosive environment.

SECTION 3-1.3 OPERATING CHARACTERISTICS

Lever hoists shall be constructed to provide the following operating characteristics:

(a) The hoist shall lift, lower, or pull a load, and apply or release tension in controlled increments when a manual force is applied to the operating lever (handle).

(b) The hoist shall lift or pull the rated load when an appropriate lever pull is exerted by one operator (see section 3-1.4).

(c) The hoist shall be equipped with a mechanism (friction brake or ratchet-and-pawl) that shall hold and control loads within the rated load when the hoist is being operated in either direction.

(d) The hoist shall be equipped with accessible operating controls.

(e) The hoist should have a free-wheeling capability that will allow the operator to adjust the load hook position when the unit is not under load.

SECTION 3-1.4 PERFORMANCE CHARACTERISTICS

See Tables 3-1.4-1, 3-1.4-2, 3-1.4-3, and 3-1.4-4 for generally available lever hoist capacities and typical performance characteristics.

SECTION 3-1.5 OVERLOAD LIMITING DEVICE

An overload limiting device, when furnished, shall be designed to permit operation of the hoist within its rated load and to limit the amount of overload that can be lifted or applied by a properly maintained lever hoist under normal operating conditions.

The overload device may allow the lifting or applying of an overload, but shall be designed to prevent the lifting or applying of an overload that could cause damage to the lever hoist.

The overload device is an emergency device and shall not be used to measure the maximum load to be lifted or applied and shall not be used to sense the overload implied by a constrained load.
### Table 3-1.4-1 Typical Characteristics of Manually Lever-Operated Chain Hoists: Ratchet-and-Pawl Type, Welded Link and Roller Chain

<table>
<thead>
<tr>
<th>Rated Load, ton (kg)</th>
<th>Number of Chains</th>
<th>Headroom, in. (mm)</th>
<th>Lever Pull-to-Lift Rated Load, lbf (kN)</th>
<th>Weight, lb (kg)</th>
<th>Lever Length, in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 (454)</td>
<td>1</td>
<td>9–11 (230–280)</td>
<td>98–105 (0.44–0.47)</td>
<td>5–9 (2–4)</td>
<td>12–15 (305–380)</td>
</tr>
<tr>
<td>3/4 (680)</td>
<td>1</td>
<td>11–13 (280–330)</td>
<td>56–98 (0.25–0.44)</td>
<td>8–14 (3–7)</td>
<td>15–22 (380–560)</td>
</tr>
<tr>
<td>1 (908)</td>
<td>1</td>
<td>11–15 (280–380)</td>
<td>80–90 (0.36–0.40)</td>
<td>13–15 (6–7)</td>
<td>20–24 (510–610)</td>
</tr>
<tr>
<td>1 1/2 (1 361)</td>
<td>1</td>
<td>11–17 (280–430)</td>
<td>60–116 (0.27–0.52)</td>
<td>13–27 (6–12)</td>
<td>17–28 (430–710)</td>
</tr>
<tr>
<td>2 (1 815)</td>
<td>2</td>
<td>15–18 (380–460)</td>
<td>60–98 (0.27–0.44)</td>
<td>17–21 (8–10)</td>
<td>18–21 (460–535)</td>
</tr>
<tr>
<td>2 1/2 (2 268)</td>
<td>1</td>
<td>15–18 (380–460)</td>
<td>70–76 (0.31–0.34)</td>
<td>21–36 (10–16)</td>
<td>14–33 (355–480)</td>
</tr>
<tr>
<td>3 (2 722)</td>
<td>2</td>
<td>16–20 (405–510)</td>
<td>62–120 (0.28–0.53)</td>
<td>22–35 (10–16)</td>
<td>17–28 (430–710)</td>
</tr>
<tr>
<td>4 1/2 (4 082)</td>
<td>3</td>
<td>19–27 (480–690)</td>
<td>72–124 (0.32–0.55)</td>
<td>36–53 (16–24)</td>
<td>17–34 (430–865)</td>
</tr>
<tr>
<td>5 (4 536)</td>
<td>4</td>
<td>22–27 (560–690)</td>
<td>74–125 (0.33–0.56)</td>
<td>55–65 (25–30)</td>
<td>33–36 (840–915)</td>
</tr>
<tr>
<td>6 (5 443)</td>
<td>4</td>
<td>22–27 (560–690)</td>
<td>75–124 (0.33–0.55)</td>
<td>46–65 (21–30)</td>
<td>17–34 (430–865)</td>
</tr>
<tr>
<td>9 (8 164)</td>
<td>5</td>
<td>30–36 (760–915)</td>
<td>124–140 (0.55–0.62)</td>
<td>120–145 (54–66)</td>
<td>34–37 (865–940)</td>
</tr>
<tr>
<td>11 (9 979)</td>
<td>6</td>
<td>30–36 (760–915)</td>
<td>124–145 (0.55–0.64)</td>
<td>130–155 (59–70)</td>
<td>34–37 (865–940)</td>
</tr>
<tr>
<td>13 (11 793)</td>
<td>7</td>
<td>30–36 (760–915)</td>
<td>124–150 (0.55–0.67)</td>
<td>140–165 (64–75)</td>
<td>34–37 (865–940)</td>
</tr>
<tr>
<td>15 (13 607)</td>
<td>8</td>
<td>30–36 (760–915)</td>
<td>124–155 (0.55–0.69)</td>
<td>150–175 (68–80)</td>
<td>34–37 (865–940)</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
(a) This Table indicates the range of capacities and characteristics generally available. Those values including a dash (e.g., 98–105) denote typical ranges. Consult individual manufacturer’s catalog for specific values.

(b) Standard lifts (not shown in Table) range from 48 in. to 60 in. (1 220 mm to 1 525 mm). Longer lifts are available on application.

**NOTES:**
(1) Indicates ton of 2,000 lb.
(2) Weight ranges shown are based on standard lift range [see General Note (b)].

### Table 3-1.4-2 Typical Characteristics of Manually Lever-Operated Chain Hoists: Friction-Brake Type, Welded Link and Roller Chain

<table>
<thead>
<tr>
<th>Rated Load, ton (kg)</th>
<th>Number of Chains</th>
<th>Headroom, in. (mm)</th>
<th>Lever Pull-to-Lift Rated Load, lbf (kN)</th>
<th>Weight, lb (kg)</th>
<th>Lever Length, in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 (226)</td>
<td>1</td>
<td>9–14 (230–355)</td>
<td>28–40 (0.12–0.18)</td>
<td>6–16 (3–8)</td>
<td>12–15 (305–380)</td>
</tr>
<tr>
<td>1/4 (454)</td>
<td>1</td>
<td>9–14 (230–355)</td>
<td>40–60 (0.18–0.27)</td>
<td>9–16 (4–8)</td>
<td>14–16 (355–405)</td>
</tr>
<tr>
<td>3/4 (680)</td>
<td>1</td>
<td>10–14 (255–355)</td>
<td>32–70 (0.14–0.31)</td>
<td>12–16 (6–8)</td>
<td>10–22 (255–560)</td>
</tr>
<tr>
<td>1 (908)</td>
<td>1</td>
<td>12–15 (304–380)</td>
<td>40–75 (0.18–0.33)</td>
<td>16–20 (9–9)</td>
<td>12–20 (305–510)</td>
</tr>
<tr>
<td>1 1/2 (1 361)</td>
<td>1</td>
<td>13–17 (330–430)</td>
<td>40–87 (0.18–0.39)</td>
<td>16–32 (8–15)</td>
<td>16–22 (405–560)</td>
</tr>
<tr>
<td>2 (1 815)</td>
<td>2</td>
<td>15–17 (380–430)</td>
<td>34–87 (0.15–0.39)</td>
<td>20–36 (9–16)</td>
<td>12–21 (305–535)</td>
</tr>
<tr>
<td>3 (2 722)</td>
<td>1</td>
<td>17–19 (430–485)</td>
<td>65–90 (0.29–0.40)</td>
<td>41–45 (19–21)</td>
<td>16–21 (405–535)</td>
</tr>
<tr>
<td>3 (2 722)</td>
<td>2</td>
<td>17–21 (430–535)</td>
<td>49–95 (0.22–0.42)</td>
<td>34–50 (16–23)</td>
<td>18–22 (460–560)</td>
</tr>
<tr>
<td>4 1/2 (4 082)</td>
<td>3</td>
<td>20–24 (510–610)</td>
<td>54–96 (0.24–0.43)</td>
<td>48–90 (22–41)</td>
<td>18–21 (460–535)</td>
</tr>
<tr>
<td>6 (5 443)</td>
<td>2</td>
<td>21–24 (535–610)</td>
<td>51–71 (0.23–0.32)</td>
<td>61–70 (28–32)</td>
<td>16–21 (405–535)</td>
</tr>
<tr>
<td>6 (5 443)</td>
<td>4</td>
<td>21–25 (535–635)</td>
<td>58–108 (0.26–0.48)</td>
<td>61–110 (28–50)</td>
<td>18–24 (460–610)</td>
</tr>
<tr>
<td>15 (13 607)</td>
<td>8</td>
<td>31–36 (785–915)</td>
<td>86–120 (0.38–0.53)</td>
<td>243–260 (110–118)</td>
<td>18–24 (460–610)</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
(a) This Table indicates the range of capacities and characteristics generally available. Those values including a dash (e.g., 98–105) denote typical ranges. Consult individual manufacturer’s catalog for specific values.

(b) Standard lifts (not shown in Table) range from 48 in. to 60 in. (1 220 mm to 1 525 mm). Longer lifts are available on application.

**NOTES:**
(1) Indicates ton of 2,000 lb.
(2) Weight ranges shown are based on standard lift range [see General Note (b)].
### Table 3-1.4-3 Typical Characteristics of Manually Lever-Operated Wire-Rope Hoists: Ratchet-and-Pawl Type

<table>
<thead>
<tr>
<th>Rated Load, ton (kg)</th>
<th>Number of Falls</th>
<th>Headroom, in. (mm)</th>
<th>Lever-to-Lift Rated Load, lbf (kN)</th>
<th>Weight, lb (kg)</th>
<th>Lever Length, in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2  (454)</td>
<td>1</td>
<td>16–21 (406–533)</td>
<td>50–130 (0.22–0.58)</td>
<td>9–12 (4–6)</td>
<td>20–30 (508–762)</td>
</tr>
<tr>
<td>3/4  (680)</td>
<td>1</td>
<td>19–26 (483–660)</td>
<td>60–145 (0.27–0.65)</td>
<td>9–14 (4–7)</td>
<td>20–32 (508–813)</td>
</tr>
<tr>
<td>1  (908)</td>
<td>1</td>
<td>17–26 (432–660)</td>
<td>65–160 (0.31–0.72)</td>
<td>11–16 (5–8)</td>
<td>24–38 (610–956)</td>
</tr>
<tr>
<td>1  (908)</td>
<td>2</td>
<td>17–26 (432–660)</td>
<td>50–130 (0.22–0.58)</td>
<td>9–12 (4–6)</td>
<td>20–30 (508–762)</td>
</tr>
<tr>
<td>1  (908)</td>
<td>2</td>
<td>18–30 (457–762)</td>
<td>60–145 (0.27–0.65)</td>
<td>9–14 (4–7)</td>
<td>20–32 (508–813)</td>
</tr>
<tr>
<td>2  (908)</td>
<td>2</td>
<td>22–30 (584–762)</td>
<td>70–160 (0.31–0.72)</td>
<td>11–16 (5–8)</td>
<td>24–38 (610–956)</td>
</tr>
<tr>
<td>3  (2722)</td>
<td>2</td>
<td>27–30 (686–762)</td>
<td>70–160 (0.31–0.72)</td>
<td>24–30 (12–15)</td>
<td>20–38 (508–965)</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
(a) This table indicates the range of capacities and characteristics generally available. Those values including a dash (e.g., 98-105) denote typical ranges. Consult individual manufacturer's catalogs for specific values.
(b) Standard lifts (not shown in Table) range from 40 in. to 135 in. (102 cm to 343 cm). Longer lifts are available on application.

**NOTES:**
(1) Indicates ton of 2,000 lb.
(2) Lever pull-to-lift rated load will vary with the number of wire-wrap ropes on drum.

### Table 3-1.4-4 Typical Characteristics of Manually Lever-Operated Wire-Rope Hoists: Ratchet-and-Pawl Type

<table>
<thead>
<tr>
<th>Rated Load, ton (kg)</th>
<th>Number of Falls</th>
<th>Headroom, in. (mm)</th>
<th>Lever-to-Lift Rated Load, lbf (kN)</th>
<th>Weight, lb (kg)</th>
<th>Lever Length, in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4  (226)</td>
<td>1</td>
<td>16–18 (406–457)</td>
<td>40–100 (0.18–0.45)</td>
<td>6–8 (3–4)</td>
<td>16–30 (406–762)</td>
</tr>
<tr>
<td>1/2  (454)</td>
<td>1</td>
<td>19–21 (483–533)</td>
<td>50–110 (0.22–0.49)</td>
<td>7–13 (3–6)</td>
<td>16–30 (406–762)</td>
</tr>
<tr>
<td>3/4  (680)</td>
<td>2</td>
<td>19–21 (483–533)</td>
<td>40–100 (0.18–0.45)</td>
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<td>1  (908)</td>
<td>1</td>
<td>17–25 (432–635)</td>
<td>55–120 (0.27–0.54)</td>
<td>8–17 (4–8)</td>
<td>20–32 (508–813)</td>
</tr>
<tr>
<td>1  (908)</td>
<td>2</td>
<td>20–23 (508–584)</td>
<td>70–130 (0.31–0.58)</td>
<td>12–17 (6–8)</td>
<td>20–36 (508–914)</td>
</tr>
<tr>
<td>2  (908)</td>
<td>2</td>
<td>24–28 (610–711)</td>
<td>40–105 (0.18–0.45)</td>
<td>7–13 (3–6)</td>
<td>16–30 (406–762)</td>
</tr>
<tr>
<td>1  (908)</td>
<td>2</td>
<td>22–34 (559–684)</td>
<td>60–120 (0.27–0.54)</td>
<td>8–17 (4–8)</td>
<td>20–32 (508–813)</td>
</tr>
<tr>
<td>2  (908)</td>
<td>2</td>
<td>22–34 (559–684)</td>
<td>70–130 (0.31–0.58)</td>
<td>12–17 (6–8)</td>
<td>20–36 (508–914)</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
(a) This table indicates the range of capacities and characteristics generally available. Those values including a dash (e.g., 98-105) denote typical ranges. Consult individual manufacturer's catalogs for specific values.
(b) Standard lifts (not shown in Table) range from 6 ft to 40 ft (1.8 m to 12.2 m). Longer lifts are available on application.

**NOTES:**
(1) Indicates ton of 2,000 lb.
(2) Lever pull-to-lift rated load will vary with the number of wraps of wire rope on drum.
(3) Weight ranges shown are based on standard lift range [see General Note (b)].
SECTION 3-2.1 LOAD TESTING

(a) Load Testing of New Hoists. All complete new hoists shall be tested by the manufacturer with a test load of at least 125% of rated load, except hoists incorporating overload devices, in which case the hoist shall be tested with at least rated load. In addition, all operating functions shall be checked to ensure proper operation.

(b) Load Testing of Altered Hoists. All hoists in which load sustaining parts have been altered, replaced, or repaired shall be tested statically or dynamically by or under the direction of an appointed person, and a record of the test should be made. The applied test load shall be at least equal to the rated load or greater, as approved by the manufacturer. The replacement of the lifting medium is specifically excluded from this hoist load test; however, a functional test of the hoist should be made prior to putting the hoist back in service.

SECTION 3-2.2 MANUAL

The manufacturer shall furnish with each hoist one copy of an instruction manual. The manual shall include information on the following:

(a) operation
(b) inspection and testing
(c) lubrication, maintenance, and repair

SECTION 3-2.3 OPERATION

3-2.3.1 Procedures

Operating procedures recommended in the manufacturer’s instruction manual should be followed. In addition to these recommendations, operating practices (para. 3-2.3.2) and load handling procedures (para. 3-2.3.3) should be followed.

3-2.3.2 Operating Practices

It is recommended that the following practices be adhered to when using a lever-operated hoist:

(a) The supporting structure or anchoring means shall have a load rating at least equal to that of the hoist.

(b) The operator shall familiarize himself with the operation of the equipment and its proper care. If adjustments are necessary or any damage is known or suspected, the hoist shall be removed from service and not used until corrections are made.

(c) Hoists shall be used only in locations that will allow the operator to be free of the load.

(d) The operator shall ensure that he has firm footing and is otherwise secured before operating the hoist.

(e) The operator shall have access to the operating lever.

(f) Before using the hoist, the operator shall be certain that all people in the area are clear of the load.

(g) The operator shall not engage in any activity that will divert his attention while operating the hoist.

(h) The operator shall not attempt to use the free-wheeling feature with any load on hoist. Load shall not be applied with the hoist control in the free-wheeling mode.

(i) Hoists shall not be operated by means other than hand power nor operated with an extension on the lever.

3-2.3.3 Handling the Load

(a) The rated load shall not be exceeded.

(b) The hoist lifting medium shall not be wrapped around the load.

(c) The load shall be attached to the hook or attached by means of slings or other approved devices.

(d) The load slings or other approved devices shall be seated properly in the saddle of the hook, and the hook latch (if used) shall be closed before operating the hoist. Hooks shall not be tip loaded.

(e) Before lifting or pulling a load, the operator shall be certain that
(1) the lifting medium is not kinked, twisted, or fouled, and is properly seated in the sprocket(s) or drum(s)
(2) load is not caught on any obstructions
(3) multiple-strand parts are not twisted and are free to take up load with the load equalized on each supporting strand
(4) clearance is available to avoid personal injury or property damage

(f) Hoists shall not be operated until the load block, lifting medium, and hoist body are directly in line with the direction of loading to avoid side pull.
(g) When starting to lift or pull, the load should be moved a few inches, at which time the hoist should be checked for proper load-holding action. The operation shall be continued only after the operator is assured that the hoist is operating properly.
(h) Do not release the hoist lever while it is under load. Keep control of the lever until the ratchet pawl is engaged and the lever is at rest.
(i) A hoist shall not be used to lift, support, or otherwise transport people.
(j) The operator shall not use the hoist to carry loads over people.

(k) The operator should not leave a loaded hoist unattended at the end of a work shift or for extended periods during the work shift. Where operations are such that this condition cannot be avoided, the operator must be assured that the condition does not create a hazard to people or property.

SECTION 3-2.4 INSPECTION AND MAINTENANCE PROCEDURES

The lever-hoist user should be familiar with ASME B30.21, which provides recommendations for inspection and maintenance procedures. The inspection and maintenance procedures as covered in the manufacturer's manual should be followed. Consideration should also be given to pertinent federal, state, and local regulations in the use of this equipment.
Nonmandatory Appendix A
Performance Requirements for Manually Lever-Operated Chain Hoists Used in Marine and Other Applications As Required by the U.S. Department of Defense (DOD)

A-1 GENERAL

A-1.1 Scope

This Appendix provides performance requirements beyond those cited in ASME HST-3 for manually lever-operated chain hoists for use in marine and other applications as required by the Department of Defense (DOD). This Appendix, in conjunction with ASME HST-3, is replacing the requirements of MIL-H-904 for manually lever-operated chain hoists.

A-1.2 Classification

Manually lever-operated chain hoists shall be of the following classes and types [see A-5.1(b)].

A-1.2.1 Classes

(a) Class 1: conventional weight for general material handling
(b) Class 2: lightweight for general material handling
(c) Class 3: free of cast-iron load-bearing parts, used for special purpose service (such as reactor component handling)

A-1.2.2 Types

(a) Type A: manually lever-operated, link or roller chain hoist, hook suspension fixed capacity
(b) Type B: manually lever-operated, link or roller chain hoist, hook suspension convertible capacity

A-1.3 Definitions

brittle material: material showing less than 10% elongation in gage length for the tensile test specimen.
operating cycle: the lifting and lowering of the hoist rated load through a minimum distance of 4 ft with a 6-sec maximum pause between lifting and lowering.
recovered materials: materials that have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials.

A-1.4 References to Other Codes and Standards

Refer to the following publications, copies of which may be obtained from the publisher as indicated. The latest edition shall be used.

ASTM A143, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement (DOD adopted)
ASTM A304, Standard Specification for Carbon and Alloy Steel Bars Subject to End-Quench Hardenability Requirements (DOD adopted)
ASTM B26, Standard Specification for Aluminum Alloy Sand Castings (DOD adopted)

Publisher: American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428 (www.astm.org)

MIL-DTL-917, Electric Power Equipment, Basic Requirements for

Publisher: Department of Defense, Standardization Documents Order Desk, Building 4D, 700 Robbins
A-2 PERFORMANCE REQUIREMENTS

A-2.1 General

Performance requirements shall be in accordance with ASME HST-3 and as specified in this Appendix.

A-2.2 Application

Metals susceptible to corrosion attack in a sea-water environment shall be treated, plated, or painted to provide corrosion resistance. Assemblies containing dissimilar metals shall be protected against galvanic corrosion in accordance with MIL-DTL-917 and MIL-STD-889. In order to minimize electrolytic corrosion between dissimilar metals in contact with each other, metal-to-metal contact shall be limited to those metals that, when coupled, are in accordance with sea water corrosion of galvanic couples requirements of MIL-DTL-917. If a metal is coated or plated, the coating or plating metal rather than the base metal shall be considered in metal-to-metal contact between parts that depend upon coating or plating for corrosion resistance.

When specified [see A-5.1(c)], hooks shall be zinc plated. Zinc plating shall be in accordance with ASTM B633, Type II, Class Fe/Zn 12. The hook throat safety device shall be constructed of noncorrosive material or treated for corrosion resistance.

When specified [see A-5.1(d)], the link load chain shall be protected by zinc coating in accordance with ASTM B633, Type II, Class Fe/Zn 12. The roller chain shall have a blue oxide finish supplemented by a coating of combination lubricant and rust preventative. The safeguarding against and procedure for detecting embrittlement of zinc coating shall be in accordance with ASTM A143.

A-2.3 Characteristics: Types A and B, Manually Lever-Operated Link or Roller-Chain Hoist, Hook Suspension, Fixed (A) and Convertible (B) Capacity

Types A and B shall be hook suspended, lever-operated, and shall contain a mechanism for hoisting and lowering, which is either a pawl-ratchet-and-lever or a spur-gearied (friction brake) arrangement constructed for safe operation of the hoist. There shall be no limitation on position of the hoist when in use. Hoists shall be in accordance with Tables 3-1.4-1 and 3-1.4-2 and as specified herein.

A-2.4 Lubrication

Lubricants used shall be readily available and be free of ozone-depleting chemicals (ODC).

A-2.5 Painting

Paints and coatings shall be lead- and chromate-free.

A-2.6 Workmanship

The hoist shall withstand any operation specified herein without malfunction or component failure caused by faulty workmanship. Edges and surfaces exposed to operating and maintenance personnel shall be smooth and rounded so that a hazardous surface does not exist.

A-2.7 Interchangeability

In no case shall parts be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, performance, and strength. Component parts for the same type of hoists from the same manufacturer shall be interchangeable to the greatest extent possible.

A-3 MECHANICAL REQUIREMENTS

A-3.1 Design Stress

The maximum combined stress in component parts shall not exceed 35% of the tensile yield strength of the material for hoist operation at rated load. The maximum combined stress in component parts shall not exceed 70% of the tensile yield strength of the material. For all classes of hoists at rated load, the safety factor for load-bearing parts shall not be less than 3, based on the yield strength of the materials used; or a minimum safety factor of 5, based on the ultimate strength, whichever provides the lowest design stress. For hoists requiring repair parts, all wear parts shall be readily accessible for replacement. Equivalent spares for the same class and type hoists shall be interchangeable.

When specified [see A-5.1(e)], the hoist shall withstand grade A high-impact shock. Unloaded hoists, when stowed on a pad, shall withstand high-impact shock in accordance with grade A of MIL-S-901, without permanent deformation or degradation of any operating functions.
A-3.2 Load Chain

As specified in A-5.1(f), load chain shall be link- or roller-type. The load chain shall have a safety factor of 5 for the rated load of the hoist, based on the ultimate strength of the material. The load chain shall be selected from any of the AISI grade designations of ASTM A304 or ASTM A322. The load chain shall be easily replaceable.

A-3.2.1 Load Chain Container. When specified [see A-5.1(g)], hoists shall be equipped with a load chain container of durable construction to store the slack load chain. The load chain container shall have sufficient volume to contain the slack load chain and shall be located to prevent interference with the hoist operation.

A-3.2.2 Load Chain Sprocket and Shaft. The load chain sprocket may be integral with or rigidly connected to the load chain shaft. Welding of the load chain sprocket to the shaft is not permitted.

A-3.3 Chain Stop

Type B convertible capacity hoist may have a chain stop attached to the load chain end in lieu of securing the chain to the hoist. The chain stop shall prevent unreeving of the hoist and shall be removable.

A-3.4 Lever

The operating lever length for Types A and B shall be a maximum of 34 in. measured from the center of the yoke pin to the extreme end. The hoist shall engage to lift or lower with a lever stroke of 36 deg or less. The hoist shall permit a lever power stroke through a minimum arc of 60 deg.

A-3.5 Load Hooks

Hook throat openings shall be in accordance with the dimensions shown in Table A-3.5-1. The hook shall be clearly marked with manufacturer identification and allowable hook load or allowable hook load designator. Positive means shall be provided to prevent the load hook from loosening due to rotation of the load.

<table>
<thead>
<tr>
<th>Hoist Rated Load, lb (kg)</th>
<th>Minimum Hook Throat Opening, in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 (453.6)</td>
<td>0.75 (19.1)</td>
</tr>
<tr>
<td>2,000 (907.2)</td>
<td>0.906 (23.0)</td>
</tr>
<tr>
<td>3,000 (1,360.8)</td>
<td>1.0 (25.4)</td>
</tr>
<tr>
<td>4,000 (1,814.4)</td>
<td>1.125 (28.6)</td>
</tr>
<tr>
<td>5,000 (2,268.0)</td>
<td>1.125 (28.6)</td>
</tr>
<tr>
<td>6,000 (2,721.6)</td>
<td>1.5 (38.1)</td>
</tr>
<tr>
<td>7,500 (3,402.0)</td>
<td>1.375 (34.9)</td>
</tr>
<tr>
<td>10,000 (4,536.0)</td>
<td>1.625 (41.3)</td>
</tr>
<tr>
<td>11,000 (4,989.5)</td>
<td>2.0 (50.8)</td>
</tr>
<tr>
<td>13,000 (5,896.7)</td>
<td>2.063 (52.4)</td>
</tr>
<tr>
<td>15,000 (6,803.9)</td>
<td>2.063 (52.4)</td>
</tr>
<tr>
<td>17,000 (7,711.1)</td>
<td>2.063 (52.4)</td>
</tr>
<tr>
<td>20,000 (9,071.9)</td>
<td>2.25 (57.2)</td>
</tr>
<tr>
<td>25,000 (11,339.9)</td>
<td>2.25 (57.2)</td>
</tr>
<tr>
<td>30,000 (16,607.8)</td>
<td>2.75 (70.0)</td>
</tr>
<tr>
<td>40,000 (18,143.7)</td>
<td>3.0 (76.2)</td>
</tr>
</tbody>
</table>

A-3.6 Construction

Rotating shafts shall be supported in antifriction, lubricated, or self-lubricated bearings or bushings. Shaft bushings or bearings shall be enclosed against entry of foreign matter. Rotating and sliding surfaces shall be lubricated. Chain replacement shall be accomplished by use of simple hand tools. Gears shall be enclosed against foreign matter (such as dirt, dust, and water spray) in a casing that will permit ready access for inspection and cleaning. Positive means of securing loose parts shall be provided to prevent any component from working loose.

A-3.6.1 Hoist Brake. Hoist construction shall provide for automatic brake operation to secure a suspended load if the hand lever is released or operating mechanism fails. Lowering shall be possible only by manual
operation of the hoist hand-lever. The brake device shall be self-adjusting for the service life of the brake lining. The brake shall support the required hoist loads with no evidence of permanent deformation or excessive wear. The brake device and brake surfaces shall be protected against the retention of dirt, dust, and water.

A-3.7 Chain Guides

Enclosed chain guides shall be provided to ensure that the hoist load chain enters the sprocket in the proper position to prevent misalignment or jamming of the hoist load chain and sprocket. These guides, if bolted on, shall have means to prevent loosening under vibration.

A-3.8 Overload Protection

Mechanical overload limiting devices shall not be permitted in naval applications unless the hoist is provided with a mechanical load brake and the mechanical overload limiting device is not installed on the load side of the hoist.

A-3.9 Materials

Materials used shall be of sufficient hardness and strength to withstand intended use and applicable tests.

A-3.9.1 Recycled, Recovered, or Environmentally Preferable Materials. Recycled, recovered (see A-1.3), or environmentally preferable materials should be used to the maximum extent possible, provided the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

A-3.9.2 Prohibited Materials. Cadmium, asbestos, beryllium, brittle materials, and magnesium or magnesium-based alloys (except steel or aluminum alloys that contain less than 0.5% magnesium) shall not be used unless otherwise specified.

A-3.9.3 Material for Class 3 Hoists. Metal castings, weldments, and steel forging used for load-bearing parts on Class 3 hoists shall be inspected as specified. Cast iron shall not be used for load-bearing parts. Cast iron for nonload-bearing parts shall be in accordance with ASTM A48, Class 35 or better. Aluminum castings for load-bearing or nonload-bearing parts shall be in accordance with ASTM B26 or ASTM B108, Type UNS A03560, temper T6.

A-4 TESTING, MARKING, AND DATA

A-4.1 Testing

A-4.1.1 High-Impact Shock. When specified [see A-5.1 (e)], the hoist shall undergo the high-impact shock test in accordance with MIL-S-901. Resilient mountings shall not be used. Hoists shall be tested in stowed position (horizontal attitude), constrained (not fastened) to prevent lateral movement, and clamped or strapped to resist vertical movement. Hoists shall have the load hook or load block retracted for the test. The test fixture for mounting the hoist shall conform, as applicable, to the deck-platform or bulkhead mounting figures shown in MIL-S-901. Following successful completion of high impact shock test, the hoist shall be subjected to the following tests:

A-4.1.2 Load Testing

A-4.1.2.1 Static Load. The hoist shall support a static load of twice the maximum rated load for 10 min. The load shall be suspended with the hoist load chain extended to the limit of the hoist rated lift height. This extension may be changed to not less than 1 ft, provided the contractor demonstrates that the entire length of chain will support 200% of rated load. The suspended test load shall be held by the hoist brake for 10 min.

A-4.1.2.2 Dynamic Load. The hoist, fixed capacity and convertible capacity (convertible hoists shall be reeved for their fixed load rating), shall be loaded to 150% of rated load and operated by hoisting and lowering the test load through the required lift height. With the test load clear of the ground, a minimal length of 1 ft of load chain shall be Overhauled in each direction. This test shall be performed at a minimum speed of 10 ft/min. Hoist shall operate satisfactorily, and the brake shall exhibit no sign of slippage.

A-4.1.3 Efficiency. The hoists shall be loaded to rated capacity and operated to raise the load through any conveniently measured distance. A spring balance shall be connected not more than 2 in. from the end of the opening lever of the hoist. The mean force required to operate the lever through one operating stroke shall be determined by measuring the force at five equidistant positions over the operating stroke. Measurement shall be made with the spring balance always at a right angle to the lever and for at least six
successive operating strokes. The total distance through which the operating force acts and the distance through which the load is lifted shall be noted. The mechanical efficiency of the hoist shall be determined from the following formula:

$$E = \frac{C \times L \times 100}{P \times T}$$

where
- $E$ = mechanical efficiency, %
- $C$ = rated capacity of hoists, lb
- $L$ = distance lifted, ft
- $P$ = mean operating force, lbf
- $T$ = total distance through which $P$ acts

**A-4.1.4 Endurance.** Types A and B hoists shall be tested to 2,000 continuous operating cycles when single-reeved. The operating cycles for testing multiple-reeved hoists shall be determined by dividing 2,000 by the number of hoist load lines. Convertible hoists shall be reeved for their fixed rated load. An operating cycle for these hoists shall consist of lifting and lowering the hoist rated load through a distance of 6 in. Lever-operated hoists shall be operated at a minimum speed of 15 ft/min and a maximum of 70 ft/min. Hoists shall be clean and free of foreign material and excess lubricant. During operation of these hoists, no wear particles greater than 0.031 in. in any direction shall be generated.

**A-4.2 Marking**

**A-4.2.1 Identification.** In addition to the requirements of ASME B30.21, para. 21-1.1.3, the hoist shall be identified with the following:
- (a) hoist weight and shock (grade), as applicable
- (b) class and type, as applicable
- (c) rated load
- (d) ASME B30.21, para. 21-1.1.3
- (e) national stock number (NSN) (if established)
- (f) contract or order number
- (g) date of manufacture

**A-4.2.2 Class 3 Marking.** For Class 3 hoists, space shall be provided, either on the identification plate or in another prominent location, for a 21-word inscription (135 spaces) of 0.125 in. minimum size lettering. Metal castings for load bearing parts of Class 3 hoists shall be identified with the foundry heat number cast or stamped on a raised pad 0.125 in. above the casting surface using 0.250 in. letters. When a raised pad is not practical due to space or function, the heat number shall be applied in a legible, permanent manner. Marking stamps shall be of the low-stress type.

**A-4.3 Data**

**A-4.3.1 Technical Manuals.** When specified in the contract or order [see A-5.1(h)], the manufacturer shall prepare technical manuals in accordance with the data ordering documents and include the following:
- (a) complete list of material
- (b) identification of each component for replacement
- (c) final drawings

**A-5 TYPICAL HOIST INQUIRY DATA**

**A-5.1 Acquisition**

In addition to the typical hoist inquiry data of ASME HST-3, acquisition documents must specify the following:
- (b) class, type, and rated load of hoist required (see A-1.2). When Class 3 is specified, special service should be defined.
- (c) if zinc coating of hooks is required (see A-2.2).
- (d) if zinc plating is required for load chain (see A-2.2).
- (e) hoist shock-resistance grade A or B (see A-3.1 and A-4.1.1).
- (f) type of load chain, link or roller (see A-3.2).
- (g) if chain container is required (see A-3.2.1).
- (h) if technical manual is required (see A-4.3.1).
Non-Mandatory Appendix B- Mechanical Spark Resistance Guidance for Applications in Hazardous (Potentially Explosive) Locations

B-1 GENERAL

B-1.0 PREFACE

The electrical requirements for hoists used in hazardous locations in North America are well defined by recognized standards and codes published by NEMA, NEC, NFPA and ANSI. However, none of these documents address mechanical spark resistance for hoists used in these locations. In general, spark avoidance is required for applications in explosion hazard areas to address the explosive potential of three areas:

1. Buildup of electrostatic charges
2. Sparking caused by the impacting and friction of components
3. Excessive surface temperatures

Grounding and bonding of equipment to avoid the buildup of electrostatic charges and maximum surface temperatures for electrical components used in hazardous locations are addressed in these electrical codes and are not addressed in this appendix.

This appendix focuses on recommendations for physical features aimed at reducing the potential for generating sparks caused by the impacting and sliding of components and of excessive surface temperatures that could result from the operation of the hoist’s mechanical components.

Ensuring that a hoist is suitable for use in a potentially explosive atmosphere requires a collaborative effort of the hoist manufacturer and the end user of the hoist. The end user of the hoist must identify a qualified person(s) who is familiar with the specifics of the application who can work with the manufacturer to provide application details which may include a detailed specification for the hoist to allow the manufacturer to configure the hoist to suit the application. This configuration will be based on the information provided by the end user, applicable standards and the manufacturer’s experience. However, the ultimate responsibility for ensuring the hoist is suitable for the application remains with the qualified person(s) identified by the end user. Since mechanical spark resistance requires special considerations, collaboration between the manufacturer and user during the design/procurement portion of the project is recommended.

After installation, the equipment must be operated and maintained per the manufacturer’s recommendations as verified by the overseeing qualified person to assure continued successful operation in hazardous atmospheres.

B-1.1 SCOPE

This non-mandatory appendix provides guidance and recommendations for providing mechanical spark resistance for hoists covered under this standard when these hoists are to be used in hazardous (potentially explosive) locations as defined by the NFPA 70 National Electric Code (NEC). These recommendations are not intended to be all inclusive and the specific features required to render a hoist suitable for use in a specific hazardous location and application must be determined by a qualified person who is familiar with the specifics of the location and the application.

B-1.2 HAZARDOUS LOCATION CLASSIFICATION

The NFPA 70 NEC defines hazardous locations by Class, Division and Group as follows:

Class I - A location where explosive gases, vapors or liquids are present
Class II - A location where explosive or combustible dust is present
Class III - A location where combustible fibers or flyings are present
Division I - A location where the hazardous material is present continuously, long term or frequently
Division II - A location where the hazardous material is not likely to be present or only present in the short term
Groups A, B, C and D - A location where the hazardous material is a specific gas, liquid or vapor.
Groups E, F and G - A location where the hazardous material is specific dust, fiber or flyings.

General guidelines for mechanical spark resistance are not dependent on the specific hazardous material present in the location and therefore the recommendations made in this appendix will focus on the likelihood that the material will be present and recommendations will be made for both Division I and Division II locations.

B-1.3 REFERENCES TO OTHER CODES AND STANDARDS

NFPA 70 NEC 2017- National Electrical Code
National Fire Protection Association
One Batterymarch Park
Quincy, Massachusetts 02169-7471

DIN EN ISO 80079-36 Non-electrical Equipment for Explosive Atmospheres- Basic Methods and Requirements
NFPA 70 NEC includes specific definitions for the various classified areas where hoists may be used. These definitions and requirements shall be considered as correct for this Appendix. NFPA 70 NEC provides the requirements for all electrical aspects of electric powered hoists used in areas classified per NFPA 70 NEC. That is, motors, electrically controlled brakes, controls, wiring methods, grounding, etc.

FEM 9.751, DIN EN ISO 80079-36, DIN EN ISO 80079-37 and DIN EN 1127-1 are standards used within the European Union (EU) for machinery used in potentially explosive environments. EU standards define potentially explosive environments differently than NFPA 70 NEC. As such, there is no direct correlation between the two approaches. However, there is sufficient similarity to allow application of the EU standards as a basis for a methodology of hazard analysis and for potential design solutions for non-electrical aspects of hoists for all power sources.

Other standards that are not referenced within this Appendix may be used, at the discretion of the user, to assess the nature of the hazard and to select a viable design solution. The referenced standards are merely provided as potential sources of additional information.

B-3 MECHANICAL SPARK RESISTANCE

B-3.1 GENERAL
Hoist performance requirements will be in accordance with ASME HST-3. This appendix provides general guidance and recommendations for special features aimed at providing mechanical spark resistance for hoists covered under this standard when these hoists are to be used in hazardous (potentially explosive) locations as defined by the NFPA 70 National Electric Code (NEC).

B-3.2 MATERIALS
In general, austenitic stainless steels and alloys of bronze, brass and copper are preferred for spark resistance. However, coatings of zinc, copper and nickel alloys may be used in place of solid spark resistance materials depending on the specific hazardous location and application. Aluminum, carbon steels, magnesium and corroded materials are to be avoided in components when spark resistance is desired.

B-3.3 LOWER HOOKS AND BLOCKS
The potential of an unloaded lower hook and block to swing and impact other surfaces is relatively high in most applications. Also, in applications where metal rings, metal slings or wire ropes are used to rig the load to the hoist hook the potential for the rigging to shift and slide in the hook saddle is similarly high. Therefore, spark resistance is recommended for all lower hooks and blocks used in hazardous locations.

For Division I locations it is recommended that lower hooks and blocks be manufactured from a solid non-sparking material. If the use of solid non-sparking materials for the lower hook and block is not practical, sparking materials provided with a non-sparking coating may be used but the end user must be made aware of the potential for the coating to be worn or otherwise damaged negating the spark resistant protection and the use of metal rings, metal slings, wire ropes or other metallic rigging with coated hooks is not recommended.

For Division II locations lower hooks and blocks should be manufactured either from solid non-sparking material or from sparking materials provided with a non-sparking coating but the end user must be made aware of the potential for the coating to be worn or otherwise damaged negating the spark resistant protection.

B-3.4 HOOK LATCHES
A spring loaded hook latch being released and striking the hook and rigging with enough energy to produce a spark is relatively high in most applications and as a result spark resistance is recommended.

For both Division I and Division II locations it is recommended that hook latches and their hardware be manufactured from a non-sparking material.

B-3.5 WIRE ROPES AND LOAD CHAINS
The potential of a loaded hoist wire rope or load chain contacting a hoist drum, sheave, load wheel or other hoist component with enough energy to create a spark is relatively high in most applications. Also, a swinging lower block could result in the wire rope or load chain striking another surface. Therefore, spark resistance is recommended.

For Division I locations it is recommended that wire ropes and load chains be manufactured from a solid non-sparking material. For chain hoists, nickel diffused load chain is also an acceptable method for attaining spark resistance.

For Division II locations wire ropes and load chains should be manufactured either from solid non-sparking material or from sparking materials provided with a non-sparking coating but the end user must be made aware of the potential for the coating to be worn or otherwise damaged negating the spark resistant protection.
B-3.6 WIRE ROPE OR LOAD CHAIN GUIDES
In hoist designs where contact between the wire rope or load chain and guides is expected resulting in impact or sliding friction, spark resistance is recommended. In these cases spark resistance can be obtained by addressing either the wire rope and load chain or the guide(s).

For Division I locations it is recommended that wire ropes and load chains or the guides be manufactured from a solid non-sparking material. Also, in this case guides produced from polymer materials is an acceptable method for attaining spark resistance.

For Division II locations wire ropes and load chains or their guides should be manufactured either from solid non-sparking material or from sparking materials provided with a non-sparking coating but the end user must be made aware of the potential for the coating to be worn or otherwise damaged negating the spark resistant protection. Also, in this case guides produced from polymer materials is an acceptable method for attaining spark resistance.

B-3.7 HOIST LOAD BRAKES
The requirements for electrical hoist load brakes used in hazardous locations are addressed in the NFPA 70 NEC and will not be addressed in this appendix.

For hoist mechanical load brakes which are not enclosed and immersed in lubricant in the hoist transmission that utilize a spring actuated pawl contacting a brake ratchet mechanical spark resistance is recommended.

For both Division I and Division II locations it is recommended that brake ratchet in these mechanical load brakes be manufactured from a non-sparking material.

B-3.8 GEARING
The precision gearing used in most hoist mechanisms has a very tight mesh with limited backlash and does not present a sparking hazard in most applications. Also, most hoist gearing is enclosed and immersed in lubricants which further reduces the potential of sparking.

However, any exposed gearing with significant clearance and backlash has a much higher potential of generating a spark and therefore spark resistance is recommended.

For exposed gearing in Division I locations it is recommended that either the pinion or driven gear be made from solid non-sparking materials.

For exposed gearing in Division II locations it is recommended that either the pinion or driven gear be made from solid non-sparking material unless a qualified person reviews the application and determines spark resistance is not required for this exposed gearing.

B-3.9 SLIDING COMPONENTS
Friction from sliding contact between components generating a spark is a major concern in hazardous locations and must be addressed. In general, the best approach is to avoid sliding contact. However, when sliding contact is unavoidable, such as in friction bearings or guides, spark resistance is recommended.

For Division I locations it is recommended that one of the sliding surfaces be made from solid non-sparking materials.

For Division II locations it is recommended that one of the sliding surfaces be made from solid non-sparking material or that the surfaces be kept properly lubricated to reduce the potential for sparking.

In both Division I and Division II applications with sliding contact care must be taken to insure the surfaces are properly lubricated and not corroded.

B-3.10 CORROSION
The presence of corrosion on any surface will increase the sparking potential of the surface. Therefore, corrosion resistant materials or coatings are recommended for all surfaces that have the potential of generating a spark from sliding friction or impact.

B-4 EXCESSIVE SURFACE TEMPERATURE
Maximum surface temperatures for hazardous locations are provided in NFPA 70 NEC and these values for the specified hazardous location class should be used for all mechanical components. This appendix will focus on excessive surface temperatures that could result from the operation of the hoist’s mechanical components.

B-4.1 MECHANICAL HOIST BRAKES
Mechanical hoist brakes can be the source of excessive surface temperatures due to either frequent operation or to the brake not fully releasing (dragging). Analysis and/or testing should be performed to determine the worst case surface temperature that may be seen.

B-4.2 GEARS
Gears are normally lubricated to prevent the buildup of heat and therefore minimize excessive surface temperatures. This is the case whether the gears are open to the atmosphere or enclosed. Gears that are inadequately lubricated may be the source of excessive heat. Also, properly lubricated gears may be the source of excessive heat, if the hoist is operated frequently and/or at high loads. Analysis and/or testing should be performed to determine the worst-case surface temperature that may be seen.
B-4.3 BEARINGS
Bearings are normally used to prevent the buildup of heat and therefore minimize excessive surface temperatures. However, a bearing that is improperly lubricated or seized may be the source of excessive heat. Analysis and/or testing should be performed to determine the likelihood of these conditions, and to determine the worst case surface temperature that may be seen.

B-5 HOIST INSPECTION CONSIDERATIONS
ASME B30.21 provides specific requirements for the inspection of overhead hoists and requires pre-operation, frequent and periodic inspections and provides lists of items to be included in each of these hoist inspections. Pre-operation inspections are performed before the first use each shift and frequent and periodic inspection intervals depend on the application the hoist is being used in. The standard identifies normal service, heavy service and severe service application groups. The standard does not specifically address applications in hazardous locations but does include hazardous locations in its definition of “abnormal operating conditions”.

Since the ASME B30.21 inspection requirements do not specifically address hoists being used in hazardous locations, it is recommended that these requirements be amended as follows:
For hoists used in hazardous locations all mechanically spark resistant features provided on the hoist should be added to the lists of items to be inspected on the hoist as specified below:
For hoists used in Division I applications all components provided with non-sparking coatings should be included in pre-operation inspections to ensure the integrity of the coating and its continued ability to provide mechanical spark resistance. Components made from non-sparking materials should be included in frequent inspections.
For hoists used in Division II applications all components provided with non-sparking coatings should be included in frequent inspections to ensure the integrity of the coating and its continued ability to provide mechanical spark resistance. Components made from non-sparking materials should be included in periodic inspections.
Mechanical components that have the potential to produce high surface temperatures as discussed in Section B-4 of this appendix should be inspected during frequent inspections in line with the established inspection frequency for the hoist to ensure they are being maintained.