CHAIN & SLING INSPECTION GUIDE

To ensure long life and continued strength of CM chain, it is important that the product is properly used, inspected and maintained. This section provides details on chain and chain sling inspection methods as well as the proper use and care of chain or slings. Following these guidelines will ensure safe and long use of CM products.

In addition to what is provided in this section, ASME and OSHA have specific regulations related to chain and chain sling use. For detailed information, refer to ASME B30.9 and OSHA 1910.184

CHAIN & SLING GENERAL INSPECTION

It is important to inspect chain and chain slings regularly and to keep a record of all chain inspections. Follow the steps below when developing your inspection requirements and tracking system. CM will supply chain and sling record cards or sheets as requested.

Before inspection, clean the chain so that marks, nicks, wear and other defects can be seen. Use a non-acid/non-caustic solvent. Each chain link and sling component should be individually inspected for the conditions noted below.

1. Excessive wear and corrosion at chain and attachment bearing points. Refer to page 27, “Wear Allowance chart for Herc-Alloy 800® and 1000 chain”. The table should also be used as a guide when inspecting coupling links.
2. Nicks or gouges
3. Stretch or link elongation
4. Twists or bends
5. Distorted or damaged links, master links, coupling links or attachments, especially spread in throat opening of hooks. (Refer to other sections in this catalog for inspection guidelines regarding distortion and wear of hooks, master links and Hammerloks®.)

When inspecting chain slings specifically, it’s important to note that damage is most likely to occur in the lower portion of a sling. Therefore, particular attention should be given to those sections.

Each link or component having any condition listed above is to be marked with paint to clearly indicate rejection. Since any of the above noted conditions can affect chain performance and/or reduce the chain strength, chains and chain slings containing any of the conditions should be removed from service. A qualified person should examine the chain, assess the damage, and make a decision on whether or not repair is necessary before returning it to service. Extensively damaged chain should be scrapped.

Because of its use in critical lifting applications, repair of alloy chain should only be done by an authorized CM chain sling repair station. Nicks and gouges can be removed from the chain by a qualified person as instructed in the “Nicks and Gouges” section on this page.

CHAIN & SLING IN-DEPTH INSPECTION

Since Grade 80 and 100 chains are used for overhead lifting, and used frequently as part of a sling component, a more detailed and in-depth inspection is necessary.

TWISTING & BENDING

Twisted and bent links are relatively easy to recognize and affect chain performance significantly. Twisting and bending of links results from use of slings around sharp corners without padding, use of links with grab hooks under certain adverse conditions, and from loading of chain that is twisted, knotted, or kinked. (Refer to Hook Section for more information on grab hooks.)

Consider that chain is evaluated by applying loads in a pure tensile link end-to-link-end fashion and rated accordingly. Bent or twisted links alter this normal loading pattern significantly and thus alter inner link stresses accordingly. For this reason all chain containing twisted or bent links must be removed from service.

NICKS & GOUGES

The outsides of links are exposed to contact with foreign objects that can cause damage. Nicks and gouges frequently occur on the sides. Therefore, they usually are located on surfaces under compressive stress and their potentially harmful effects are reduced.

The unique geometry of a chain link tends to protect tensile stress areas against damage from external causes. Figure 1 shows that these tensile stress areas are on the outside of the link body at the link ends where they are shielded against most damage by the presence of interconnected links. Tensile stress areas are located also on the insides of the straight barrels, but these surfaces are similarly sheltered by their location. However, gouges cause localized increases in the link stress. They can be harmful if they are located in areas of tensile stress and particularly so if they are perpendicular to the direction of stress. Refer to Figure 1.

Figure 2 shows nicks of varying degrees of severity. Reading clockwise, at three o’clock there is a longitudinal mark in a compressive stress area. Since it is longitudinal and located in a compressive stress area, its effect is mitigated, but good workmanship calls for it to be ground out. At about five o’clock there is a deep
transverse nick in an area of high shear stress. A similar nick is located at six o’clock in the zone of maximum tensile stress. Both of these can create a potentially dangerous escalation of the local stress and must be filed out. A nick that was located at eight o’clock has been filed out properly. Although the final cross section is smaller, the link is stronger because the stress riser effect of the notch has been removed. The remaining cross section can now be evaluated for acceptability by measuring it and applying the criterion for worn chain. See “Wear Allowances Table” below.

**WEAR & CORROSION**

Corrosion results in a reduction of link cross-section and can be detected using the same criteria as that for wear. Wear can occur in any portion of a link that is subject to rubbing contact with another surface. The natural shape of chain confines wear, for practical considerations, to only 2 areas. These are, in order of importance, (a) at the bearing points of interlink contact, and (b) on the outside of the straight side barrels which may be abraded from dragging chains along hard surfaces or from under loads. Figure 3 illustrates the condition of interlink wear and shows how to inspect for it. Notice how easily such wear can be detected by collapsing the chain to separate each link from its neighbors.

When wear is observed, the next step is to determine how severe the damage is and if the chain can still be safely used. To determine this, make a caliper measurement across the worn section of chain and compare it to the minimum allowable dimension for that chain. See the chart below for minimum section dimensions or wear allowances for Columbus McKinnon Grade 80 and 100 Chain.

### WEAR ALLOWANCES OF HERC-ALLOY 800® & 1000 CHAIN

<table>
<thead>
<tr>
<th>Chain Size</th>
<th>Minimum Allowable Thickness (T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(in.)</td>
<td>(mm.)</td>
</tr>
<tr>
<td>7/32</td>
<td>5.5</td>
</tr>
<tr>
<td>9/32</td>
<td>7.0</td>
</tr>
<tr>
<td>3/8</td>
<td>10.0</td>
</tr>
<tr>
<td>1/2</td>
<td>13.0</td>
</tr>
<tr>
<td>5/8</td>
<td>16.0</td>
</tr>
<tr>
<td>3/4</td>
<td>20.0</td>
</tr>
<tr>
<td>7/8</td>
<td>22.0</td>
</tr>
<tr>
<td>1</td>
<td>26.0</td>
</tr>
<tr>
<td>1-1/4</td>
<td>32.0</td>
</tr>
</tbody>
</table>

Measure cross section at link ends to determine wear. If chain is worn to less than the minimum allowable thickness, remove from service.

Note: For sizes not listed, the Minimum Allowable Thickness can be calculated as 87% of the original material diameter.

* May also be used as a guide for CM Grade 63 Alloy Chain.

**STRETCH & CHAIN ELONGATION**

A visual link-by-link inspection is the best way to detect dangerously stretched links. The smallest sign of binding or loss of clearance at the juncture points of a link indicates a collapse in the links’ sides due to stretch. Any amount of stretch indicates overloading, and the chain should be removed from service.

Note that a significant degree of stretch in a few individual links may be hidden by the apparent acceptable length gage of the overall chain. This highlights the importance of link-by-link inspection.

There is no short-cut method that will disclose all types of chain damage. Safety can only be achieved through proper inspection procedures. There is no adequate substitute for careful link-by-link scrutiny.
OSHA CHAIN SLING INSPECTION
Since first published in final form on July 27, 1975, the OSHA Chain Sling Inspection section remains little changed. Specifically, the applicable sections of Code of Federal Regulations (29 CFR 1910.184) are quoted as follows:

(d) INSPECTIONS – Each day before being used, the sling and all fastenings and attachments shall be inspected for damage or defects by a competent person designated by the employer. Additional inspections shall be performed during sling use where service conditions warrant. Damaged or defective slings shall be immediately removed from service.

(e) ALLOY STEEL CHAIN SLINGS
(3) Inspections (i) in addition to the inspection required by paragraph (d) of this section, a thorough periodic inspection of alloy steel chain steel slings in use shall be made on a regular basis, to be determined on the basis of (A) frequency of slings in use; (B) severity of service conditions; (C) nature of lifts being made; and (D) experience gained on the service life of slings used in similar circumstances. Such inspections shall in no event be at intervals greater than once every 12 months.

(ii) The employer shall make and maintain a record of the most recent month in which each alloy steel chain sling was thoroughly inspected, and shall make such record available for examination.

(iii) The thorough inspection of alloy steel chain slings shall be performed by a competent person designated by the employer, and shall include a thorough inspection for wear, defective welds, deformation and increase in length. Where such defects or deterioration are present, the sling shall be immediately removed from service.

Note that while the requirements under (d) for daily inspections are not explicit as to scope or maintenance of records, it is possible that individual OSHA inspectors may have different views on conformity. However, the minimum 12-month interval inspections required under (e) call for thorough inspection and written records. It is this thorough type inspection which the procedures recommended in this catalog and in CMCO Training Classes are designed to satisfy. Of course, the fundamentals are equally applicable to the more cursory daily inspections made by the riggers, users, or inspectors (a competent person) and will enable them to fulfill their responsibilities efficiently.

CHAIN & SLING GENERAL CARE & USE

PROPER CARE
Chain and chain slings require careful storage and regular maintenance.

1. Store chain and chain slings on an “A” frame in a clean, dry place.
2. Avoid exposure to corrosive mediums. Oil chain before prolonged storage.
3. Never alter the thermal treatment of chain or chain sling components by heating.
4. Do not plate or change surface finish of chain or components. Contact Columbus McKinnon for special requirements.

PROPER USE
To protect both operators and materials, observe these precautions when using chain slings.

1. Before use, inspect chain and attachments following the inspection instructions on pages 26 through 28.
2. Do not exceed working load limit as indicated on the chain or chain sling identification tag. Any of the following factors can reduce the strength of the chain or sling and cause failure:
   - Rapid load application can produce dangerous overloading.
   - Variation in the angle of the load to the sling. As the angle decreases, the working load of the sling will increase. (For more information, see page 30)
   - Twisting, knotting or kinking subjects links to unusual loading, decreasing the working load of the sling.
   - Using slings for purposes other than those for which slings are intended can reduce the working load of the sling.
3. Free chain of all twists, knots and kinks.
4. Center load in hook(s). Hook latches must not support load.
5. Avoid sudden jerks when lifting and lowering.
6. Balance all loads to avoid tipping.
7. Use pads around sharp corners.
8. Do not drop load on chains.
9. Match the size and working load limit of attachments such as hooks and rings to the size and working load limit of the chain.
10. Use only alloy chain and attachments for overhead lifting.