Steel Interchange is an open forum for Modern Steel Construction readers to exchange useful and practical professional ideas and information on all phases of steel building and bridge construction. Opinions and suggestions are welcome on any subject covered in this magazine. If you have a question or problem that your fellow readers might help you to solve, please forward it to Modern Steel Construction. At the same time, feel free to respond to any of the questions that you have read here. Please send them to:

Steel Interchange
Modern Steel Construction
One East Wacker Dr., Suite 3100
Chicago, IL 60601-2001

New Questions

Listed below are questions that we would like the readers to answer or discuss. If you have an answer or suggestion please send it to the Steel Interchange Editor, Modern Steel Construction, One East Wacker Dr., Suite 3100, Chicago, IL 60601-2001.

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What is the appropriate roughness limit for thermally cut edges?

Thermal cutting is a common method for cutting steel. Inadvertent notches or gouges of varying magnitude may occur in thermally cut edges, depending upon the cleanliness of the material surface, the adjustment and manipulation of the cutting head, and various other factors.

When weld metal is to be deposited on thermally cut surfaces, AWS D1.1 Section 3.2.2 and LRFD Specification Section M2.2 specify tolerances for such imperfections and stipulate the methods to be used for the correction of defects of various magnitudes. For other thermally cut edges, however, these requirements are sometimes impractical and do not consider the actual use of the product nor the cost incurred. For these cases, the following is recommended:

1. Structural steel may be cut by any of the acceptable thermal-cutting processes, either by hand-guided or mechanically guided means. Except for copes, blocks, cuts, holes for other than bolt holes, and similar cuts for which mechanically guided cutting may not be feasible, thermal cutting shall preferably be done by machine.

2. Thermally cut edges shall conform to the following requirements for surface condition:
   a. If subjected to a calculated tensile stress, edges shall, in general, have a surface roughness value not greater than 1,000 as defined in ANSI/ASME B46.1.
   b. Mechanically guided thermally cut edges not subjected to a calculated tensile stress shall have a surface roughness value not greater than 2,000 as defined in ANSI/ASME B46.1.

3. Roughness exceeding the criteria in paragraph 2 above, and notches not more than $\frac{3}{16}$ in. deep are permitted to be removed by machining or grinding and fairing in at a slope not to exceed 1:2 1/2.

4. Notches or gouges greater than $\frac{3}{16}$ in. deep may be repaired by welding, providing:
   a. The bid documents do not require the approval of the engineer for such repair.
   b. The discontinuity is suitably prepared for good welding.
   c. Low-hydrogen electrodes not exceeding $\frac{5}{32}$ in. diameter are used.
   d. Other applicable welding requirements of AWS D1.1 are observed.
   e. The repair is made flush with the adjacent surface in a workman-like manner.
   f. The repair is inspected to assure soundness.

5. Re-entrant corners shall provide a smooth transition between adjacent surfaces, but need not be cut to a circular profile. The correction criteria of paragraphs 3 and 4 above shall apply.

How much of a joint has to be in contact to be considered to be in full contact?

Projecting elements of bolted connection attachments, such as clip angles or end plates, often are not flat in the plane of the connection because
of profile variations due to as-rolled mill tolerances or welding distortions. In double-angle connections, for example, the outstanding legs tend to bend back toward the centerline of the span.

When the connection is a snug tight or fully tensioned bearing connection, any resulting gaps are usually drawn together when the bolts are installed. In slip-critical connection, the full slip resistance of the connection will be developed regardless of the initial position of such projecting elements if the following conditions are met:
1. Some part of the connection is in contact with the support before the bolts are tensioned.
2. The bolts are subsequently tensioned in accordance with the Research Council on Structural Connections Specification on Structural Joints Using ASTM A325 or A490 Bolts.
3. The faying surfaces are drawn into contact at the bolts within the area of the bolt head or nut as illustrated.

Accordingly, the AISC Code of Standard Practice states that "projecting elements of connection attachments need not be straightened in the connection plane if it can be demonstrated that installation of the connectors or fitting aids will provide reasonable contact between faying surfaces.

Is it necessary to remove temporary welds which are not incorporated into the permanent welds?

Structural fabrication involves the use of tack welds and temporary fitting aids attached by welding. In some cases, these temporary welds are not inivporated into the permanent welds and the need to remove these welds is sometimes argues.

AISC generally recommends that such welds be allowed to remain in statically loaded (building) structures, unless provided otherwise in contract documents, but be removed on dynamically loaded (bridges) structures. This topic is addressed in greater detail in AWS D1.1 Sections 3.37, 8.14, and 9.24; when such welds are made they should be in full accordance with these provisions.

What corrective procedures are available when mill material does not meet specified dimensional tolerances?

When material received from the rolling mill does not conform to the requirements of ASTM A6/A6M, or when project specifications require more restrictive tolerances, it is recommended that the fabricator be allowed to use controlled heating, mechanical straightening, or a combination of both methods, consistent with manufacturer recommendations, to adjust cross section, flatness, straightness, camber, or sweep in either of the aforementioned cases.

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What are definitions of "injurious" and "non-injurious" used in the ASTM A6/A6M Specification. This Specification states "The material shall be free of injurious defects and shall have a workmanlike finish?"

Is a bolt hole that is greater than a standard hole but less than a oversize hole treated as a standard hole or an oversize hole?

How are composite floors designed when the floor has a hole in it that is in the effective width of the slab?

Is it permissible to burn holes for anchor bolts?

Is the surface underneath the bolt head and underneath the nut considered as part of the faying surface of the connection?