MODERN STEEL CONSTRUCTION
Algunas selecciones como lector

A. Secciones permanentes

1. Steel Intercharge

A collection of technical questions and answers on steel design, fabrication and construction

Opinión como lector.- Reto para AISC organizarlo para que sea mas útil. Tambien como un TEG. ¿ por año de las normas AISC ?

STEEL INTERCHANGE

QUESTION ASKED	QUESTION APPEARED	ISSUE QUESTION ANSWERED
How can one get the out-of-date design specification and properties and dimensions of structural steel shapes that are not currently produced?		March 1992
The Research Council on Structural Connections' Specification for Structural Joints Using ASTM A325 or A490 Bolts states that reuse of non-galvanized A325 bolts is permitted if approved by the Engineer responsible. When should the Engineer approve reuse of A325 bolts?		March 1992
What procedures should be followed when assessing steel that has been exposed to a fire?	March 1992 April 1992	August 1992 September 1992 December 1992
How has the recent allowance of snug-tight high-strength bolting for certain types of shear/bearing connections affected your projects?	March 1992 April 1992	August 1992
How do you decide when to use doubler plates and when to increase the size of the column?	March 1992 April 1992	May 1992 August 1992
What is a good "wind" connection for the top of a column	March 1992 April 1992	June 1992
How to understand connection terminology used in the AISC Manual of Steel Construction		April 1992
Consider eccentricity and what has to be done to accommodate it in various connections.	May 1992	July 1993
AISC says end-plates and shear tabs shouldn't be more than 6 or 7 bolts deep and clips shouldn't be thicker than ¾". Can these rules be relaxed if the connection is only on one side of a header beam?	May 1992	
Are there concerns about bending of the tube wall in shear tab type connection? when should the shear plate be carried through the tube section?	May 1992	September 1992 (Correction 11/92)
When would you justify the additional cost of high bond epoxy paint and coating for an exterior steel frame exposed to weather and water? What if there is standing water at the base of the column?	May 1992	August 1992
What is the effect of designing with LRFD on deflection and vibration?		July 1992
The ratio of F_y to F_u for A36 and A572 Gr.50 is not proportional. Does this effect the design of structural members?	July 1992	November 1992
Why is there a restriction for static loaded structures only, placed on end-plate moment connections? Does this include crane runways?	July 1992	November 1992
How should I connect wide-flange beams to all four faces of a structural tube column in such a way as to transfer wind moments as well as dead and live load reactions?	July 1992	October 1992 December 1992 February 1993
Is there a simple "rule-of-thumb" as to when the different types of connections are more advantageous?	August 1992	December 1992
Are washers required in connections with slotted holes because of strength requirements or are there additional reasons?	August 1992	December 1992

March 1993
1994
1995
1996
1997

Steel Interchange

This is the start of a new monthly column to discuss questions regarding structural steel design, fabrication and erection. *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 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.

Answers and/or questions should be typewritten and double spaced. Submittals that have been prepared by word-processing are appreciated on computer diskette (either as a wordperfect file or in ASCII format).

The opinions expressed in *Steel Interchange* do not necessarily represent an official position of the American Institute of Steel Construction, Inc. It is recognized that the design of structures is within the scope and expertise of a competent licensed structural engineer, architect or other licensed professional for the application of principles to a particular structure.

Information on ordering AISC publications mentioned in this article can be obtained by calling AISC at 312/670-2400 ext. 433.

How can one get the out-of-date design specifications and properties and dimensions of structural steel shapes that are not currently being produced?

When AISC prepares a new edition of the *Manual of Steel Construction* we survey the producers of structural shapes. The *Manual of Steel Construction* includes the properties and dimensions of the structural steel shapes currently rolled. The structural steel shapes are defined in the ASTM Specification A6/A6M, *Standard Specification for Rolled Steel Plates, Shapes, Sheet Piling, And Bars For Structural Use*. Surveying the producers and using the steel sections in the latest ASTM Specification A6 insures that the AISC Manual provides up-to-date information.

However, as the infrastructure ages and our buildings and bridges need renovation or retrofitting, they often have to be evaluated and, if necessary, strengthened to meet the current needs. And many of these structures were built with steel shapes and grades that are not produced today. The AISC book *Iron and Steel Beams 1873 - 1952* (AISC Publication No. M003) aims at helping engineers and architects to solve the problems that this question raises.

This book includes all of the properties and dimensions required for design of shapes that were produced in the U.S. between 1873 and 1952. In addition to providing design properties of the shapes, the book also contains a section that summarizes the history of the materials standards that were used. The data includes the tensile and yield strength requirements for the steels that were commonly used for bridges and buildings.

Iron and Steel Beams 1873 - 1952 does not contain any of the structural steel design specifications that were in effect throughout this period. Part of the reason for this is the lack of standardization prior to the organization of AISC in 1921. A great many different specifications were in use in the early 20th century: some of these had been developed by various municipalities or cities; others had been prepared by steel or construction companies. There are even instances where designers developed individual, unique design standards for major structures. However, appropriate working stress recommendations that were utilized at the time are shown in this book.

There is consequently no need to find, much less purchase a specification that is out of print. You must, though, take into account the properties of the actual steel that was used, including the very important chemical and metallurgical characteristics, as well as the production method itself. For example, if the structure in question is a bridge that was originally built in 1918, the steel is most likely ASTM A7. This material had a tensile strength between 55 and 75 ksi, and a specified minimum yield stress of 30 ksi. In addition, a laboratory evaluation of a coupon specimen from the steel is desirable, if possible. The loading and design criteria of the present-day building code can then be used along with the identified material properties to assess the adequacy of the structure.

However, it is also essential to consider the chemical composition of the steel; it is not uncommon to find that some of the older materials had relatively large amounts of agents such as sulphur and phosphorus. This composition may result in a relatively high carbon equivalent, which could make welding difficult.

(*Recent AISC* Engineering Journal's *have included several articles on reinforcing existing structures that are of great use to engineers working on renovations.*)

March 2015, maximum spacing and edge, concrete encased column

February 2015 Prying action, continuous gusset

January 2015 OMF truss System, Expansion joint, web opening in plate girder

December 2014 Eccentricity coped beams, splices in bent edge plate, bolt entering direction

September 2014 weld designation, DTI prequalified, comparing AISC 360 chapter J Append. 3 Requirements

August 2014 beam column restrained at one flange, base plate washers, fillet weld Limitations. Buckling column weak axis, tension bolted with multiple lines of bolts, large diameters bolts

July 2014 A36 plate with Fy grade 50, distortion of Moment Pend plate, pretensioned bolts of end plate

April 2014 Plate girders stiffeners, Lateral torsional Buckling of bars, fixity truss web members

March 2014 stability of beams during erection, prequalified connections strength anchor rod, Shear lag, reinforcing fillet over CJP

February 2014 Special inspection, capacity of existing welds, filling weld access hole thermal couting, group A y B bolts, Stability and ELM

January 2014, plate bending, eccentricity bolts, K area, base plate shear transfer

December 2013 Método de análisis directo

November 2013 end plate design. SFRS base design vertical welding, collector design, Bolt design strength

March 2013 double angle compression, OCBF work point,

June 2013 Tension only OCBF, single sided fillet weld, Load reversed Shear stud , SCBF Brace slender, single angel connection

January 2013 Tolerance of punches holes, k area, blast cleaning and slip connection

April 2013 Importance dynamics properties, inelastic response

March 2013, free edge buckling gusset plates,

February 2013 P delta effect , Beam column design, Prying action in end plate, Flange bending, slips joint with fills, diagonal bracing connection

August 2012 Eccentrically load single angle, reusing bolts,CJP Groove welded Flange , slender web flexure, bolted connection ductility, bent plate

September 2011 OCBF unbalanced load. Multiple washers, sloted hole,

August 2011 Fillet weld design, design of bracing connection,beam bracing, preinstalation verifying.Proper nut orientation

June 2011 Bolting cost , IMF Panel zone, , change delegate connection, fillet welded skewed plate

Sept 2010 CBRF

August 2010 BF in table B3.2 Member splice, torch couting, tension control bolts, beam column orientation.Snug thigned connection

July 2010 Restrained beam, doble angle compression peak stresses, A 307 bolts, Maximun bolt tension

May 2010 Damaged column, stiffening torsion, Lateral bracing cantilever, minimum composite shear connection

March 2010 Connection filler plate , bolted connection for seismic

October 2009 second order analysis, panel zone shear strength., single plate shear connection , nut type anchor SCBF X brace. Fillers, bolt hole size

Sept 2009 anchor rod , fillet weld size , prequalified weld, installation torque

June 2009 Stiffeners for EBF, Tensile strength anchor bolt, puching shear shear lag factor rotational restraint support, bolting seismic application

May 2009 ASTM A449, w/d ratio, weak axis flexure plate, thicknes for single plate shear

November 2008, Efective length of vertical brace, end reactions, single angle in flexural, extended single plate connection

October 2008 Slip critical bolts, Charpy V notch, Flare Bever Groove welds, block shear strength,

September 2008 KL/r for single angle, fillet weld strength

January 2008 Washers for rod installation, KL/R modified for single angle, butt splicing beams, suspension spinkle load,

July 2007 Base anchorage seismic zone, backing bar removal, Monet of group bolts.

Febrero 2007 Braced Frame seismic connection

April 2003, Finger shims in bolted joist, seismic design double plate, prying action of tees and doble angle,backing bars for CJP grove welds

March 2003 OCBS in low buildings, OMFT under flexure,

Feb 2003 Net area calculation, Whitmore section.Seismic column splices

January 2003 bolt holt sizes,Tees under flexure,

August 2002 Built up shapes, shear capacity of bolts, workable gages, anchor roda

June 2002 Seismic design of base plates, restrained condition, shear lag

May 1998, composite beam,continum steel truss

2.Steelwise

March 2015 Connection design responsibility. How s it been goin?

December 2014 The right connection

December 2014 Construccion mixta

October 2014 Stability bracing

June 2014 Design Guide 13 Wide Flange Column stiffener

February 2014 Tips to take your team to the top´

January 2014 Reinforcing the point

December 2013 K factor

August 2012 Bent plate

July 2010 Horizontal bracing

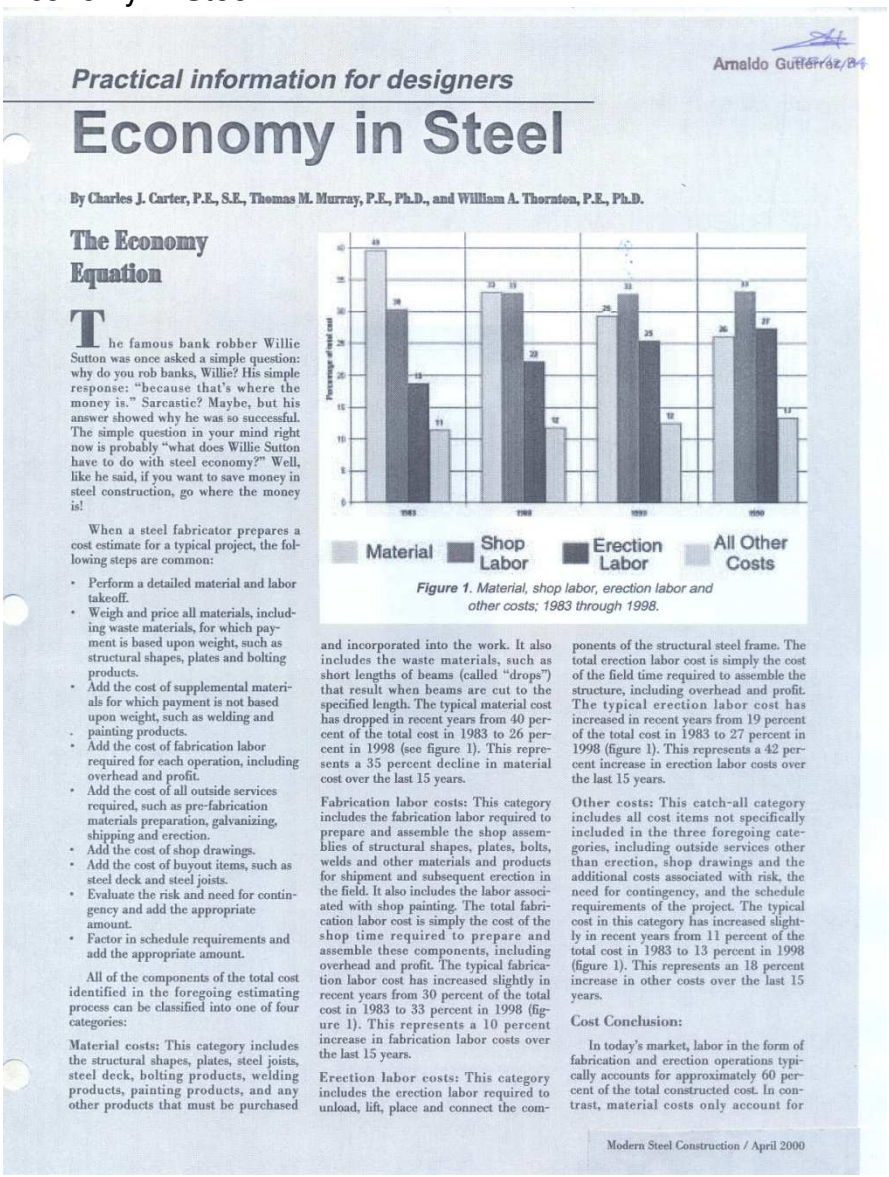
January 2009 Are you properly specifying materials?

Opinión como lector.- Reto para AISC organizarlo para que sea mas útil. Tambien como un TEG. ¿ por año de las normas AISC ?

3. OTRAS SECCIONES DE MSC

August 2009 existing bracing connection , Beam bracing, single plate shear

April 2000 Economy in Steel



Arnaldo Gutiérrez/BH

Practical information for designers

Economy in Steel

By Charles J. Carter, P.E., S.E., Thomas M. Murray, P.E., Ph.D., and William A. Thornton, P.E., Ph.D.

The Economy Equation

The famous bank robber Willie Sutton was once asked a simple question: why do you rob banks, Willie? His simple response: "because that's where the money is." Sarcastic? Maybe, but his answer showed why he was so successful. The simple question in your mind right now is probably "what does Willie Sutton have to do with steel economy?" Well, like he said, if you want to save money in steel construction, go where the money is!

When a steel fabricator prepares a cost estimate for a typical project, the following steps are common:

- Perform a detailed material and labor takeoff.
- Weigh and price all materials, including waste materials, for which payment is based upon weight, such as structural shapes, plates and bolting products.
- Add the cost of supplemental materials for which payment is not based upon weight, such as welding and painting products.
- Add the cost of fabrication labor required for each operation, including overhead and profit.
- Add the cost of all outside services required, such as pre-fabrication materials preparation, galvanizing, shipping and erection.
- Add the cost of shop drawings.
- Add the cost of buyout items, such as steel deck and steel joists.
- Evaluate the risk and need for contingency and add the appropriate amount.
- Factor in schedule requirements and add the appropriate amount.

All of the components of the total cost identified in the foregoing estimating process can be classified into one of four categories:

Material costs: This category includes the structural shapes, plates, steel joists, steel deck, bolting products, welding products, painting products, and any other products that must be purchased and incorporated into the work. It also includes the waste materials, such as short lengths of beams (called "drops") that result when beams are cut to the specified length. The typical material cost has dropped in recent years from 40 percent of the total cost in 1983 to 26 percent in 1998 (see figure 1). This represents a 35 percent decline in material cost over the last 15 years.

Material | Shop Labor | Erection Labor | All Other Costs

Figure 1. Material, shop labor, erection labor and other costs; 1983 through 1998.

Fabrication labor costs: This category includes the fabrication labor required to prepare and assemble the shop assemblies of structural shapes, plates, bolts, welds and other materials and products for shipment and subsequent erection in the field. It also includes the labor associated with shop painting. The total fabrication labor cost is simply the cost of the shop time required to prepare and assemble these components, including overhead and profit. The typical fabrication labor cost has increased slightly in recent years from 30 percent of the total cost in 1983 to 33 percent in 1998 (figure 1). This represents a 10 percent increase in fabrication labor costs over the last 15 years.

Erection labor costs: This category includes the erection labor required to unload, lift, place and connect the components of the structural steel frame. The total erection labor cost is simply the cost of the field time required to assemble the structure, including overhead and profit. The typical erection labor cost has increased in recent years from 19 percent of the total cost in 1983 to 27 percent in 1998 (figure 1). This represents a 42 percent increase in erection labor costs over the last 15 years.

Other costs: This catch-all category includes all cost items not specifically included in the three foregoing categories, including outside services other than erection, shop drawings and the additional costs associated with risk, the need for contingency, and the schedule requirements of the project. The typical cost in this category has increased slightly in recent years from 11 percent of the total cost in 1983 to 13 percent in 1998 (figure 1). This represents an 18 percent increase in other costs over the last 15 years.

Cost Conclusion:

In today's market, labor in the form of fabrication and erection operations typically accounts for approximately 60 percent of the total constructed cost. In contrast, material costs only account for

December 1999 Lower flange under hung crane
CB cantilevers

3.Steel Quiz

Pendiente completar con regiostros mas antiguos

steel quiz

This month's Steel Quiz takes a look at end-plate moment connection design as covered in AISC Design Guide 16: *Flush and Extended Multiple-Row Moment End-Plate Connections*, by Thomas M. Murray and W. Lee Shoemaker (www.aisc.org/designguides).

1 A flush end-plate moment connection is typically used:
- **a.** In frames subject to light lateral loads
- **b.** Near inflection points of gable frames
- **c.** At beam-to-column moment connections
- **d.** a and b
- **e.** a, b and c

2 True or False: End-plate moment connections discussed in Design Guide 16 have adequate moment-rotation stiffness to be classified as a fully restrained (FR) moment connections.

3 True or False: ASTM A325 bolts in end-plate moment connections not subjected to fatigue or high-seismic loading can be installed in the snug-tightened condition.

4 True or False: Weld access holes are required for the flange-to-end-plate welds for extended end-plate moment connections subject to high-seismic loading.

5 In Equation 2-7, taken from Design Guide 16, the 1.11 factor:
- **a.** Accounts for the variability in the yield strength of the end plate
- **b.** Accounts for residual stresses in the end-plate due to welding
- **c.** Is an additional safety factor created to help simplify the end-plate design procedure
- **d.** Ensures thick-plate behavior and not prying action

6 In Equation 2-7, taken from Design Guide 16, the γ_i factor:
- **a.** Ensures that a flush end plate qualifies as a fully restrained (FR) connection
- **b.** Is a yield line adjustment factor to account for extended end-plate configuration
- **c.** Accounts for minimum pretension in an snug-tight bolt
- **d.** Accounts for end-plate connections with axial loads

$$t_{p,req} = \sqrt{\frac{(1.11)\gamma_i \phi M_{pe}}{\phi_d F_{py} Y}} \quad (2\text{-}7)$$

7 True or False: When pre-tensioned or snug-tightened bearing type end-plate moment connections are used, it is common practice to assume that the compression bolts resist all of the shear force.

8 When the applied moment is less than the design flexural strength of the beam, the beam flange to end-plate weld can be designed for the required flexural strength but not less than _____ of the specified minimum yield strength of the connected beam flange.
a. 30% **b.** 40% **c.** 60% **d.** 80%

9 True or False: For beam shear resistance, the authors of Design Guide 16 recommend using the full depth of the beam web.

10 Stitch bolts between the tension and compression flange are sometimes used in deep end-plate connections to:
- **a.** Meet OSHA safety requirements
- **b.** Reduce plate separation caused by welding distortions
- **c.** Increase the overall connection stiffness to meet the requirements in Section B3.6 in the AISC *Specification*
- **d.** Provide additional bolts just in case some bolts can't be installed due to fit-up issues

TURN PAGE FOR ANSWERS

steel quiz

Steel Quiz made its first appearance in the November 1995 issue of *Modern Steel Construction*. This month's Quiz takes a look at some of the best questions from 1997.

1 ASTM A325 and A490 provisions include head dimensions that are larger than those for other bolt grades. Why?

2 Was the **fillet** weld shown in Figure 1 deposited from A to B or from B to A?

3 When steel is specified to be painted without indication of required surface preparation method, what surface preparation is used?

4 An ASTM A325 bolt is subjected to a tension load that is gradually increased until failure. Which of the following descriptions best fits the failed bolt?
- **a.** The threads have stripped, causing the bolt and nut to separate
- **b.** The unthreaded bolt shank is necked-down and fractured near its mid-length
- **c.** The threaded portion of the shank between the nut and thread runout is elongated and fractured
- **d.** The unthreaded bot shank is fractured near the juncture of the bolt head and shank

5 A welder is observed and is not wearing a welding helmet. Which of the following welding processes is most likely being used?
- **a.** Flux-cored arc welding (FCAW)
- **b.** Submerged arc welding (SAW)
- **c.** Gas metal arc welding (GMAW)
- **d.** Shielded metal arc welding (SMAW)
- **e.** None of the above

6 Name three methods for setting a column base to proper elevation.

7 **True or False:** In the AISC *Specification*, beams and their connections are designed to have equivalent reliability.

8 Give two examples each of common structural shapes that have: a. only unstiffened elements; b. both unstiffened and stiffened elements; and c. only stiffened elements.

9 In seismic moment frame design, a strong-column/weak-beam design requirement is sometimes imposed. What does this mean?

10 There are at least six methods that are used to cut steel. How many can you name?

TURN PAGE FOR ANSWERS