Steel SolutionsCenter

Anchor Rods

Can't live with 'em, can't live without 'em.

By Dan Swiatek and Emily Whitbeck with contributions from Victor Shneur, P.E.

Many common anchor rod problems are easier to avoid than you think!

In life there are a few things that are necessary evils, and anchor rods and column base plate connections seem to be one of them. These connections have caused problems on many building projects, but by looking at the challenges that others have faced and showing how these challenge have been successfully overcome, perhaps we can make the use of these important connections more bearable. This article will give some guidelines on how you can prevent common problems in the design of anchor rods and base plate connections, and will help the designer to avoid expensive field repairs and schedule delays. Specifications and design guides are already in place to aid in the design of these connections for strength, but issues of constructability should be considered on every project, to ease the construction process. The following chart offers some common challenges and easy solutions for how to improve everyday anchor rod and column base plate connection applications.

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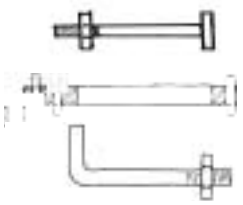
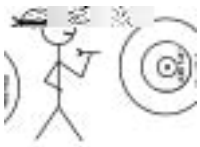
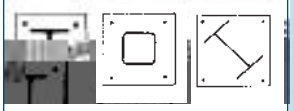
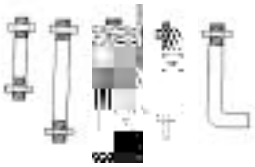
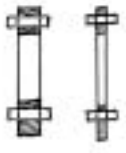
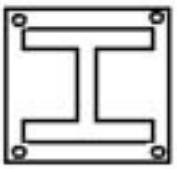
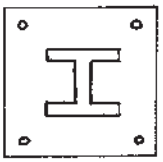
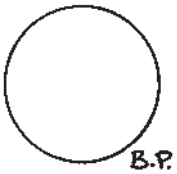
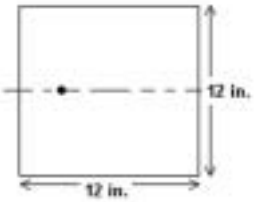
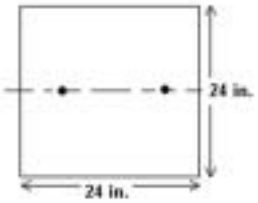
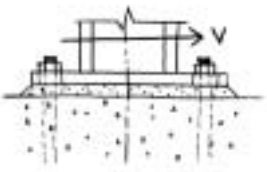
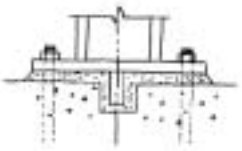
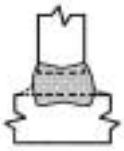
Solutions to 17 Common Anchor Rod and Base Plate Dilemmas

	Common Mistakes			
				
2	u			
3			u Specify one anchor rod setting and base plate for all exterior columns, and one for all interior columns, based on the largest size. This will be conservative for lighter columns, but it will greatly simplify detailing and installation.	
4	Similarly to specifying settings, specifying many different sizes can lead to complications.		This will be conservative in some cases but will reduce installation mistakes. Try to make sure the two sizes differ enough to avoid confusion and mistakes (at least ½-in. difference in diameter).	

Solutions to 17 Common Anchor Rod and Base Plate Dilemmas (cont'd.)

	Common Mistakes		Easy Solutions	
	Don't specify settings that are seldom used if you don't have to. ✗		Keep it simple by making anchor rod settings and base plates doubly symmetric about column centerlines. Simplicity prevents problems.	
	This provides no room for errors that are likely to occur. ✗		This will allow for oversized holes and clearances. Field fixes to enlarge holes or to add plate washers will also be possible.	
	Foundation inaccuracies are common. Often, the standard oversized hole dimensions used for bolts are not sufficient because there is not enough tolerance available. ✗		Use the recommended hole sizes for base plates shown in AISC *Design Guide 1*, or in Table 14-2 of the 3rd Edition *Manual*. This will allow for even more tolerance in the foundation for anchor rod placement. Make sure to use a heavy plate washer over the hole.	
	If the smaller dimension is less than 24 in., do not specify grout holes. ✗		If more than one hole is required, grout holes need to be spaced approximately 18 in. apart. Grout holes should be 2 in. to 3 in. in diameter.	
	Anchor rods cannot be expected to transfer shear forces due to their larger holes and the use of grout.		A shear key or embedded plate with welded side plates can be used to transfer a large horizontal shear force from the column base to the foundation.	
10	Column web-to-flange fillets provide very little strength and may cause fabrication problems. Welding that wraps around the flange toes for a column and base plate connection creates unwanted stress concentrations.		A typical gravity column only requires a fillet weld at the flange. Columns in framing systems that experience uplift and shear will require fillet welds on both sides of the flange and web.	
11	If a simple fillet weld can resist uplift or shear, then using a complete-joint-penetration groove weld for the connection between the column and base plate is unnecessary and expensive.		Use a fillet weld on both sides of a joint than a CJP groove weld, if possible. Remember that the fillet weld will benefit from the directional strength increase factor.