New and Revised Codes & Standards

(from BSI Updates July 2010)

BS EN PUBLICATIONS

BS EN ISO 14344:2010
Welding consumables. Procurement of filler materials and fluxes
Supersedes BS EN ISO 14344:2005

NEW WORK STARTED

BS 7371-8 (Revision)
Coatings on metal fasteners. Specifications for sherardized coatings
Will supersede BS 7371-8:1998

DRAFT BRITISH STANDARDS FOR PUBLIC COMMENT

10/30219617 DC
BS EN ISO 898-1 AMD1 Mechanical properties of fasteners made of carbon steel and alloy steel. Bolts, screws and studs with specified property classes. Coarse thread and fine pitch thread

AD 348
Bolt resistance tables in the Eurocode Blue Book

This AD Note provides clarification of resistance values given in SCI publication P363 *Steel building design: Design data* (the Eurocode Blue Book).

The publication covers Class 4.6, 8.8 and 10.9 bolts, including non-preloaded and preloaded hexagon head bolts and countersunk bolts. Resistances for preloaded bolts include values for serviceability limit state and ultimate limit state. The calculation of resistances is described in the explanatory notes, Section 11.1 of the publication.

For Class 4.6 non-preloaded bolts, two tables of resistances are provided; for Class 8.8 and 10.9 non-preloaded bolts, three tables are provided.

For each bolt class, the first table gives tension resistance, shear resistance and minimum thickness to avoid punching shear, all determined in accordance with Table 3.4 of BS EN 1993-1-8. Although the punching shear resistance needs to be verified, this is not a common mode of failure in practical situations. The publication provides the minimum thickness required to ensure punching shear does not occur. Note that the dimensions of preloaded and non-preloaded bolts are different and therefore, for the same bolt size, the minimum thickness to prevent punching shear differs for the two types of bolts.

The second table gives bearing resistances for various ply thicknesses. The bearing resistance depends on the bolt arrangement, defined by e_1, e_2, p_1 and p_2. The end distance e_1 has been taken as twice the bolt diameter and resistances have been calculated for these values of e_1. However, the values of e_1 printed in the tables have been rounded up to the nearest 5 mm. The edge distance e_2 has been chosen to match common practice; values rounded to 5 mm have been chosen. The values of pitch, p_1 and p_2, have been chosen such that resistance values based on them are not more critical than those based on e_1 (the 'exact' value rather than the rounded value) and e_2, and they also have been rounded up to the nearest 5 mm. Examples of values in the second table are illustrated as follows:

Page C-303, Table 2, Class 8.8, M16 bolts:

$e_2 = 25$ mm

$e_1 = 2d = 2\times16 = 32$ mm, which is tabulated as 35 mm

$$p_1 = 3d_0\left(\frac{e_1}{3d_0}+\frac{1}{4}\right)=3\times18\left(\frac{32}{3\times18}+\frac{1}{4}\right)=45.5 \text{ mm, which is tabulated as 50 mm}$$

$p_2 = 2e_2 = 2 \times 25 = 50$ mm

For this bolt arrangement:

$$\alpha_b = \min\left(\frac{e_1}{3d_0};\ \frac{p_1}{3d_0}-\frac{1}{4};\ \frac{f_{ub}}{f_u};\ 1.0\right)=\min\left(\frac{32}{3\times18};\ \frac{45.5}{3\times18}-\frac{1}{4};\ \frac{800}{410};\ 1.0\right)=0.593$$

$$k_1 = \min\left(2.8\frac{e_2}{d_0}-1.7;\ 1.4\frac{p_2}{d_0}-1.7;\ 2.5\right)=\min\left(2.8\frac{25}{18}-1.7;\ 1.4\frac{50}{18}-1.7;\ 2.5\right)=2.189$$

For a ply thickness of 10 mm in S275:

$$F_{b,Rd} = \frac{k_1\alpha_b f_u dt}{\gamma_{M2}} = \frac{2.189\times0.593\times410\times16\times10}{1.25\times10^3} = 68.1 \text{ kN}$$

This is the value tabulated in P363.

If the resistance calculation were carried out using the tabulated values of $e_1 = 35$ mm and $p_1 = 50$ mm, then the resistance would increase to 74.4 kN.

The third table, for bolt classes 8.8 and 10.9, gives bearing resistances for increased values of e_1, e_2, p_1 and p_2, which give higher bearing resistance. As for the second table, values have been chosen according to an exact multiple of bolt or hole diameter and then rounded up to the nearest 5 mm. Resistances have been calculated based on the exact values, not the rounded values. The calculation has been based on the following values of e_1, e_2, p_1 and p_2:

$e_2 = 1.5d_0$

$e_1 = 3d$

$p_1 = 3.75d_0$

$p_2 = 3d_0$

The third table is not given for class 4.6 bolts because increasing the bolt spacing only has a modest effect. For an increased bearing resistance, a higher bolt class is recommended.

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