

# AD 263

## Limitations of Bolt Grades to BS 5950-1 and Eurocode 3.

The values for the strength of bolts in shear, bearing and tension are given in Tables 30, 31 and 34 of BS 5950-1: 2000. In the last line of each of these tables, a formula is given which covers bolts of other grades not listed in the tables. The use of these formulae is restricted by the provision that  $U_b \leq 1000 \text{ N/mm}^2$  where  $U_b$  is the specified minimum tensile strength of the bolt. This has the effect of limiting the choice of bolt to Grade 10.9 at the upper end of the range.

The reason for this limitation is that very high grade bolts, such as Grade 12.9 and 14.9, are considered to have insufficient ductility to be used safely in normal structural connections. Therefore, it is also not acceptable to use these very high grade bolts even while limiting their  $U_b$  value for design purposes to  $1000 \text{ N/mm}^2$ .

The formulae in the last line of Tables 30, 31 and 34 of BS 5950-1: 2000 have been provided to cover bolts that lie between Grades 4.6 and 10.9, for example, Grades 5.6 and 6.8, which are sometimes used.

Similarly, Eurocode 3 has, to date, restricted normal connection design with non-preloaded bolts to bolt grades no higher than Grade 10.9. This appears in ENV1993-1-1: 1992 Clause 6.5.3. The same restriction exists in the draft prEN1993-1-8, *Design of Joints*, in Clause 3.4.