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6 BOLTING

6.1 GENERAL

6.1.1 Scope

- 1 This Part specifies the requirements for bolting associated with structural steelwork.

6.1.2 References

- 1 The following standards are referred to in this Part:
- BS 2583.....Podger spanners
 - BS 3692.....ISO metric precision hexagon bolts, screws and nuts
 - BS 4190.....ISO metric black hexagon bolts, screws and nuts.
 - BS 4395.....High strength friction grip bolts and associated nuts and washers for structural engineering.
 - BS 4606.....Recommendations for the co-ordination of dimensions in building. Coordination sizes for rigid flat sheet materials used in building.

6.2 ORDINARY BOLTED ASSEMBLIES

6.2.1 Bolt/Nut Combinations

- 1 The combinations of bolts and nuts shall be not less than the following:
- (a) 4.6 bolts with grade 4 nuts (BS 4190)
 - (b) 8.8 bolts with grade 8 nuts (BS 3692)
 - (c) 10.9 bolts with grade 12 nuts (BS 3692).
- 2 Any bolt assemblies which seize when being tightened shall be replaced.

6.2.2 Differing Bolt Grades

- 1 Different bolt grades of the same diameter shall not be used in the same structure, except when agreed otherwise by the Engineer.

6.2.3 Bolt Length

- 1 The bolt length shall be chosen such that, after tightening, at least one thread plus the thread run-out will be clear between the nut and the unthreaded shank of the bolt and at least one clear thread shall show above the nut.

6.2.4 Washers

- 1 When the members being connected have a finished surface protective treatment which may be damaged by the nut or bolt head being rotated, a washer shall be placed under the rotating part
- 2 A suitable plate, or heavy duty, washer shall be used under the head and nut when bolts are used to assemble components with oversize or slotted holes.

6.2.5 Taper Washers

- 1 When the bolt head or nut is in contact with a surface which is inclined at more than 30° from a plane at right angles to the bolt axis, a taper washer shall be placed to achieve satisfactory bearing.

6.2.6 Galvanized Nuts

- 1 Nuts shall be checked after being galvanized for free running on the bolt and retapped if necessary to ensure a satisfactory tightening performance.

6.2.7 Bolt Tightening

- 1 Bolts may be assembled using power tools or shall be fully tightened by hand using appropriate spanners in accordance with BS 2583.

6.2.8 Fitted Bolts

- 1 Precision bolts to BS 3692 may be used as fitted bolts when holes are drilled or reamed after assembly so that the clearance in the hole is not more than 0.3 mm.

6.3 FIT-UP WHEN USING ORDINARY BOLTS

6.3.1 Fit-up

- 1 Connected parts shall be firmly drawn together. If there is a remaining gap which may affect the integrity of the joint, it shall be taken apart and a pack inserted.

6.3.2 Reaming

- 1 Where parts cannot be brought together by drifting without distorting the steelwork, rectification may be made by reaming, provided the design of the connection will allow the use of larger diameter holes and bolts.

6.4 HIGH STRENGTH FRICTION GRIP ASSEMBLIES

6.4.1 Bolt/Nut/Washer Combinations

- 1 Bolt/nut/washer combinations shall comply with BS 4395 Parts 1 or 2, as appropriate.

6.4.2 Tightening

- 1 The use of friction grip bolts shall comply with BS 4604. Part 1 or 2.
- 2 Tightening which complies with BS 4604 Part 1, may be by the torque control method, part-turn method, or with load indicating devices used in accordance with the manufacturer's recommendations.

6.4.3 Calibration of Torque Equipment

- 1 Torque spanners and other devices shall have a calibration check at least once per shift, and shall be re-calibrated where necessary in accordance with BS 4604.

6.4.4 Discarded Bolt Assemblies

- 1 If, after complete tightening, a bolt or nut has to be slackened off, the whole bolt assembly is to be disposed of.

6.5 FIT-UP WHEN USING HSFG BOLTS

6.5.1 Fit-up

- 1 Connected parts shall be firmly drawn together with all bolts partially tightened. The joint shall then be examined and if there is any remaining gap which may affect the integrity of the joint, it shall be taken apart and a pack inserted before recommencing the tightening procedure.

6.5.2 Reaming

- 1 Where parts cannot be brought together by drifting without distorting the steelwork, rectification can be made by reaming, provided that the design of the connection will allow the use of larger diameter bolts.

- 2 Calculations shall be made to demonstrate that the connection remains adequate for the forces in the connection.

END OF PART