Cooper & Turner Ltd
Sheffield Road
Sheffield, S9 1RS
South Yorkshire
England
United Kingdom

T: +44 (0) 114 256 0057
E: sales@cooperadnturner.co.uk
W: www.cooperandturner.co.uk

High Strength Weathering Steel Structural Bolting Assemblies PC 8.8 Hex

Use of BS EN 14399-3 High Strength Weathering Steel Structural Bolting Assemblies for Preloading Property Class 8.8 Hex

Identification

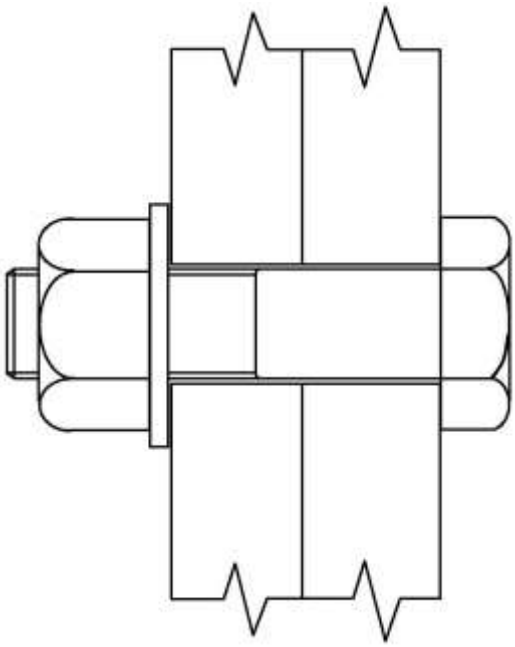
Cooper & Turner BS EN 14399-3 High Strength Weathering Steel Structural Bolting Assemblies for Preloading are identified by the letter 'W' which appears, as an addition to the standard product marking, on each of the components of the assembly i.e. on the bolt, on the nut and on the washer.

Assembly Configuration

The assembly configuration for BS EN 14399-3 weathering steel property class 8.8 hexagon head bolting assemblies is with the washer fitted under the nut and the assembly is to be tightened by nut rotation, as follows:-

a) BS EN 14399-3 weathering steel property class 8.8 hexagon head bolt (marked: 8.8 HR W)
b) BS EN 14399-5 weathering steel hardened plain washer (marked: H W)
c) BS EN 14399-3 weathering steel property class 10 nut (marked: 10 HR W)

The components shall be assembled as shown below The bolt is placed in the steelwork and at the other side of the connection the hardened plain washer is fitted and the nut is assembled with the side containing the marking facing outwards and the smooth unmarked side of the nut against the washer.



Assembly configuration for EN 14399-3 Weathering Steel Property Class 8.8 Assembly - Tightened by nut rotation
Figure 1

Use of BS EN 14399-3 High Strength Weathering Steel Structural Bolting Assemblies for Preloading Property Class 8.8 Hex

Installation of Weathering Steel Structural Bolting Assemblies
It is recommended that these weathering steel structural bolt, nut and washer assemblies are installed using the UK part turn method as detailed in the Manual of Contract Documents for Highway Works (MCHW), Volume 1 - Specification for Highway Works Series 1800 Structural Steelwork, Clause 1808.5.1 Tightening of preloaded bolts paragraphs 4 and 5.
http://www.standardsforhighways.co.uk/ha/standards/mchw/index.htm

Dimensions of Holes for BS EN 14399-3 Assemblies
The nominal clearance for round holes is the difference between the nominal hole diameter and nominal bolt diameter. The hole size shown in Table 1 is in accordance with BS EN 1090-2:2008+ A1:2011

Table 1	
Nominal clearances for bolts (mm)	
Nominal bolt diameter (mm)	24
Normal round holes (mm)	2
Tolerance on hole diameter ± 0.5mm	

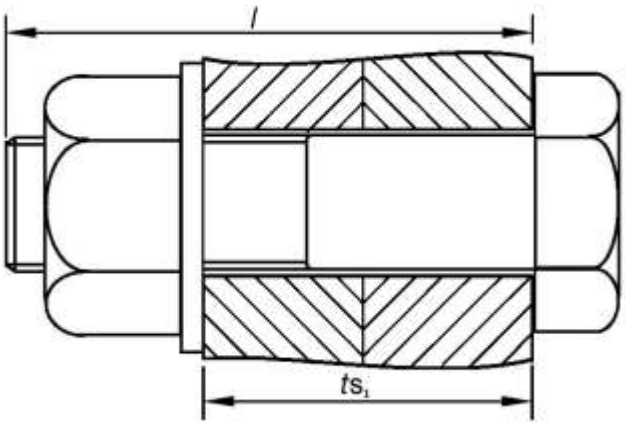
Grip lengths for BS EN 14399-3 Weathering Steel PC 8.8 Assemblies

Table 2 below is provided for guidance only. Whilst this information is provided in good faith, no member of the Andaray group of companies shall be under any responsibility or liability in respect of errors or information that is found to be incorrect or for any reliance the user may place on it.

The bolt thread lengths shown in BS EN 14399-3:2005 do not provide, in the case of some of the shorter bolt lengths, the minimum four threads in the grip required by BS EN 1090-2. Cooper & Turner recognised this fact and have for a number of years manufactured certain of their BS EN 14399-3 assemblies with longer thread lengths to satisfy the minimum threads in the grip required by BS EN 1090-2. Table 2 therefore only applies to Cooper & Turner manufactured BS EN 14399-3 PC 8.8 assemblies consisting of a hexagon bolt, nut and one BS EN 14399-5 washer.

Table 2

Grip Lengths of BS EN 14399–3 Weathering Steel PC 8.8 Assemblies with one BS EN 14399-5 washer Tightened by UK Part Turn Method



Grip Lengths with one washer ts_1

Thread	M24	
Bolt Length	ts_1	
	min	max
60	21	29
70	26	39
80	26	49
90	45	59
100	55	69
110	65	79
120	75	89
130	79	99
140	89	109
150	99	119
160	109	127
170	119	137
180	129	147
190	139	157
200	149	167

For the calculation of grip lengths ts_1 the following formulae have been used

$ts_{1.max} = l_{min} - m_{max} - h_{max} - 1P$

$ts_{1.min} = l_{gmax} + 4P - h_{min}$

where

ts_1 grip length; the total thickness of the clamped parts between the nut bearing face and the bolt bearing face less the thickness of the washer, (mm)

l length of the bolt, (mm)

m height of the nut, (mm)

h washer thickness, (mm)

P thread pitch, (mm)

l_g distance from the bearing face to the first full form (full profile) thread (mm)

NOTE: This table is provided for guidance only, see disclaimer at bottom of page

Corrosion
BS EN 14399-3 weathering steel assemblies, bolts, nuts and washers will corrode if not properly protected. They must be kept in a clean dry and well ventilated store. It is important that only the number required for immediate installation are taken from the stores in order that none are allowed to lie about on site and deteriorate.

Installation Tips
Check that all the bolts, nuts and washers are the required property class / designation before fixing.
Ensure that the bolts fit the holes freely – forcing the bolts into the holes by means of hammering would damage the threads
It is most important that impact wrenches have adequate capacity to tighten bolts within about 15 seconds (slightly longer if gear driven wrenches used). Prolonged impacting can damage the bolt assembly to such an extent that the bolt may be fractured.
In selecting a tool, it is wise to choose one which has a torque output in excess of the theoretical figure required for tightening the largest bolt for which it will be needed, thus making some allowance for loss of performance due to wear, air leakage etc., and to help overcome the energy absorbed by higher than usual thread friction or 'springy' joints.
In order to obtain optimum tool performance the tool manufacturer's specification regarding air pressure, air flow volume and hose size must be followed.
The only way to confirm that a particular tool is suitable is by judging its performance in bolt tightening under actual site conditions.
Where steelwork is to be left exposed, tightening and inspection should be carried out within the shortest time to prevent corrosion

Problems tightening BS EN 14399-3 assemblies
The occasional problems which may be encountered when tightening BS EN 14399-3 assemblies can be generally categorised under three headings:-

1) Fit – Ensure that the bolts fit the holes freely and that poor alignment of the holes is not causing the bolts to trap.

2) Tooling – Using adequate capacity impact wrenches and satisfactory thread condition, the final tightening operation should be completed within about 15 seconds (slightly longer if gear driven wrenches used). If it is not check for dry, rusty or damaged threads, poor fit, bad hole alignment or for a tool fault

3) Additional Lubrication – The nuts which Cooper & Turner supply with their BS EN 14399-3 assemblies are lubricated but in certain circumstances e.g. if the assemblies have experienced less than ideal storage conditions, additional lubrication may be necessary.
During the tightening of BS EN 14399-3 assemblies high frictional stress can develop and in certain circumstances the frictional stress can lead to torsional failure of the bolts before the proof load is achieved. This high frictional stress can be reduced by the application of a suitable high pressure lubricant which should be applied both to the nut threads and the nut washer face. In Cooper & Turner's experience the most effective and economical lubricant for this purpose is tallow*.
The use of a high pressure lubricant in the way described has no detrimental effect whatsoever on the functioning of the installed BS EN 14399-3 assemblies. The lubricant simply allows the torque applied to the nut to be more efficiently transferred into bolt shank tension.

* In the UK, tallow is generally available from plumbers' merchants. In parts of the world where tallow may not be available a product called 'stick wax', manufactured by a number of companies including Johnson and Castrol, is used for on-site lubrication of fasteners, alternatively a grease with a high molybdenum content may be effective. The high pressure lubricant selected should be of medium to high viscosity and should be applied both to the nut threads and nut washer face in order to prevent the possibility of contaminating the inner faces of the BS EN 14399-3 joint.

Final Note

The recommendations detailed in this data sheet are a summary of our experience.
The final responsibility for the specification and the use of BS EN 14399-3 High Strength Weathering Steel Structural Bolting Assemblies for Preloading Property Class 8.8 must lie with the Designer, Consultant or Engineer, who must satisfy themselves that what they are specifying is what they themselves know from their own experience to be suitable, for the particular application for which they are responsible.