DTI's Technical Report #24

Coronet Load Indicators – load/gap relationship on unloading and loading

Introduction

When tightening a group of bolts in a joint, the tightening of the later bolts may cause flexure of the plies with consequent relaxation of tension in the bolts initially tightened. It is customary to minimize this effect by tightening in a pattern from the center of the joint outwards and if necessary, repeating the sequence to obtain even tension in all bolts. These tests investigate whether load relaxation in a high strength bolt results in a measurable increase in Load Indicator gap.

Summary

It was found that Coronet Load Indicators would show loss of load by a gap increased from the original full load measurement. Re-tightening until the gap was slightly less than the original full load measurement restored the tension.

Procedure

A 7/8" diameter A325 High Strength Bolt was fitted with Coronet Load indicator under the head and tightened in a Norbar load meter to an average indicator gap of 0.015" then untightened at approximately 4-1/2" kip steps, average gap noted, and finally re-tightened back to the original load.

The test was repeated on two further bolts.

Results

Test 1		Test 2		Test 3	
Load Kips	Gap Inches	Load Kips	Gap Inches	Load Kips	Gap Inches
Down		Down		Down	
37.4	0.015	39.6	0.015	38.0	0.015
34.2	0.0152	35.2	0.0154	25.8	0.016
28.7	0.0154	29.4	0.0158	21.3	0.016
24.2	0.0158	25.6	0.0162	15.7	0.0168
18.8	0.0164	21.1	0.0166	11.2	0.0176
14.4	0.0166	16.4	0.017	5.2	0.0188
5.8	0.0184	12.1	0.0174		
		2.5	0.0194		
Up		Up		Up	
36.8	0.0148	37.4	0.015	34.8	0.015
37.7	0.0144	40.0	0.014	37.8	0.0136

N.B.—The Coronet Load indicators used in these tests were calibrated to give a minimum bolt tension of 36.05 kips at 0·015" average gap. ASTM A325 has since increased the required tension to 39.25 kips. Coronet Load Indicators have been modified accordingly.

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