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ASTM F959 Compressible washer type direct tension indicators (DTIs) in diameters 1/2 to 1-1/2 inches

ASTM F959 covers the requirements for compressible washer type direct tension indicators in diameters ranging from 1/2" to 1-1/2" inclusive. These washers are capable of indicating the achievement of a specified minimum bolt tension. They are available in two grades for use with A325 and A490 structural bolts and are also available in a weathering steel option for both grades.

### F959 Types

<b>Type 325 and 325-3</b>	For use with A325, F1852 and A325-3, F1852-3 structural bolts
<b>Type 490 and 490-3</b>	For use with A490, F2280 and A490-3, F2280-3 structural bolts

### F959 Acceptable Compression Load Range

Diameter	Type 325 and 325-3, in kips	Type 490 and 490-3, in kips
1/2	12 – 14	15 – 18
5/8	19 – 23	24 – 29
3/4	28 – 34	35 – 42
7/8	39 – 47	49 – 59
1	51 – 61	64 – 77
1-1/8	64 – 77	80 – 96
1-1/4	81 – 98	102 – 122
1-3/8	97 – 117	121 – 145
1-1/2	118 – 143	148 – 178

### F959 Chemical Requirements, Heat Analysis

Element	Type 325 and 490	Type 325-3 and 490-3
Carbon	0.30 - 0.55%	
Manganese	0.50 – 0.90%	
Phosphorous, max	0.040%	0.040%
Sulfur, max	0.045%	0.050%
Silicon	0.15 – 0.35%	0.15 – 0.35%
Chromium		0.45 – 0.65%
Nickel		0.25 – 0.45%
Copper		0.25 – 0.45%

- Weathering steel DTIs may also be made from any of the type 3 steels listed in A325 and F436
- Weathering Steel DTIs having Copper, Sulfur, and Phosphorous conforming to the above, and having a Corrosion Resistance Index of 6 or higher calculated on the basis of the heat analysis as described in Guide 101 Predictive Method based on the data of Larabee and Coburn shall be considered acceptable.