Ford Motor Company

ENGINEERING MATERIAL SPECIFICATION

Material Name | Specification Number

BOLT - SERRATED | **WSD-M1A291-A1**
WSD-M1A291-A2

1. SCOPE

The materials defined by this specification are heat treated steels with controlled surface hardness.

2. APPLICATION

This specification was released to define the requirements of serrated shank, round headed bolts used in applications such as wheel bolts etc.

3. REQUIREMENTS

3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

3.2 MATERIAL

The choice of steel composition is at the manufacturer's discretion and shall be suitable to meet the specified hardenability and other properties.

The general quality of manufacture of the steel and wire product for bolt making shall conform to the relevant national standard for the country of sourcing. In the absence of a national standard or for referee purposes, the steel shall conform to ISO 4954 section 1. Specific requirements for composition, mechanical properties and treatment condition of the wire shall conform to ISO 4954 or to the relevant national or industry standard.

3.3 HARDENABILITY

The selected material shall have a minimum hardenability according to the nominal thread diameter of the bolt.

NOMINAL THREAD DIAMETER mm	JOMINY HARDNESS HRC minimum	HARDENING TEST Hardness at mid radius HV30 minimum
Up to and including 10 mm	44 at 5 mm	450

Date	Action	Revisions	
2002 09 30	Revised	Updated and renumbered	
1997 01 20	Revised	Delete para 5.2; Updated	C. Sales
1986 10 31	SM/ER4151TC	Released. JPC. Lines	

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Over 10 up to and including 20 mm	44 at 7 mm	450
Over 20 up to and including 24 mm	44 at 9 mm	450

3.4 HEAT TREATMENT

All bolts shall be heat treated to the required level as indicated.

3.4.1 CORE HARDNESS, HV30 — A1 300 - 380, A2 280 - 360

For referee purposes the core hardness shall be determined at the mid-radial position on a cross section taken either 1d from the threaded end or from the serrated zone.

3.4.2 SURFACE HARDNESS, HV5 — A1 380 - 500, A2 350 - 460

The surface hardness shall be determined on the flat of the head at a position not within the nominal diameter of the bolt. No more than 0.02 mm of surface shall be removed during preparation of a suitable surface for the hardness test.

3.4.3 CASE DEPTH, max — 0.25 mm

Case depth shall be determined for referee purposes by the microhardness HV 0.3 method. The case depth is that depth with a hardness of 30 Vickers points above the actual core hardness. The surface hardness for this test shall be determined at 2.5 - 3 impression diagonals from the surface.

The bolts shall contain no decarburisation and this shall be assessed in the spline region.

3.5 MANUFACTURE

3.5.1 Bolts up to and including 12 mm nominal thread size shall be cold forged and the serrations and threads shall be rolled before heat treatment. Bolts of more than 12mm diameter may be machined from bar.

3.5.2 Laps formed at the crest of serrations shall not be deeper than 75 % of the overall serration height. Laps formed in the crest of threads shall not extend deeper than 33 % of the thread height. No laps shall exist in the thread flanks below the effective diameter. Provided overall serration diameter is correct and the torque retention test is satisfactory, malformed serrations can be accepted.

3.5.3 The bolts shall be free from burrs, seams, scale, irregular surface, sharp edges or other features which would adversely affect performance or ease of assembly.

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