GM WORLDWIDE ENGINEERING STANDARDS	General Specification	GMW15559

Bend Test for Heat Treated Parts Made from Flat Rolled or Wire Steel Products

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Scope. This standard describes the procedures to be used in determining the bend test ductility of heat treated parts or heat treated and plated parts made from flat, hot or cold rolled steel or round steel rod or wire products. Parts capable of being bent to the print specified minimum angle without fracture per this procedure are considered to have adequate bend ductility for the heat treated or heat treated and plated condition specified.

1.2 Mission/Theme. The bend test ductility of heat treated parts is to be measured from flat, hot or cold rolled steel or round steel rod or wire products.

1.3 Classification. Not applicable.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3059

3 Test Preparation and Evaluation

3.1 Resources.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.1.3 Facilities. Not applicable.

3.1.4 Equipment.

3.1.4.1 Vise.

3.1.4.2 Hammer.

3.1.4.3 Length of steel pipe.

3.1.4.4 Bevel protractor graduated in 1 mm increments.

3.1.4.5 V-block or fixture.

3.1.4.6 Mandrel.

3.1.4.7 Bend test tool.

3.1.5 Test Vehicle/Test Piece. Test piece is made from flat, hot-rolled or cold rolled steel or round steel rod or wire products. Part may be heat-treated or non-heat treated steel.

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3.1.6 Test Time. Not applicable.

3.1.7 Test Required Information. Three procedures for bend testing, differing in the method of applying the bend load, are included in this standard. Procedure A covers a variable, impact hammer-type test; Procedure B covers a uniform non-shock load bend test; Procedure C is a combination of Procedures A and B particularly applicable to case hardened parts.

3.1.8 Personnel/Skills. Not applicable.

3.2 Preparation. Not applicable.

3.3 Conditions.

3.3.1 Environmental Conditions. Not applicable.

3.3.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

3.4 Instructions. Not applicable.

3.5 Data. Not applicable.

3.6 Safety. This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

3.7 Documentation. Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM Department prior to the start of delivery of production level components or materials.

Any change to the component or material, e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases, a shorter test can be agreed to between the responsible GM department and the supplier.

3.7.1 Test Results. Report as either **Acceptable** or **Not Acceptable**.

3.7.1.1 A part that has withstood bending to the minimum part specified angle without visible cracking or fracture at the bend radius is acceptable.

3.7.1.2 A part that cracks or separates completely at less than or equal to the print specified angle is unacceptable for its intended use.

3.4.1.3 For Case Hardened Parts Only. The part is acceptable if it shows no cracking or separation in excess of the hairline splintering of the case.

3.7.1.4 Deviations from Test Procedure. Deviations from the requirements of the test procedures shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4 Requirements and Procedure

4.1 General.

4.1.1 Test Sample Preparation. Not applicable.

4.1.2 Bend Line Location. The bend line location and bend angle shall appear on part prints (see Figure 2, Figure 4, and Figure 6). In some cases, it may be necessary to select an alternate bend line using the following criteria:

4.1.3 Section should be free of sharp holes or other stress concentrations.

4.1.4 Locate bend line proximate to the area where service stress occurs.

4.1.5 Sufficient material shall be available on either side of the bend for adequate support and bending.

4.2 Test Procedure.

4.2.1 Procedure A.

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