



Designation: **B797—15 B797 – 20**

Standard Test Method for Surface Finger-Oxide Penetration Depth and Presence of Interparticle Oxide Networks in Powder Forged (PF) Steel Parts¹

This standard is issued under the fixed designation B797; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This test method covers a metallographic method for determining the maximum depth of surface finger-oxide penetration and the concentration of subsurface interparticle oxide networks in critical areas of powder forged steel parts.

1.2 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[E3 Guide for Preparation of Metallographic Specimens](#)

[E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *surface finger-oxides*—*finger-oxides, n*—surface finger-oxides are surface oxides that follow prior particle boundaries into a powder forged part from the surface and cannot be removed by physical means such as rotary tumbling. ~~Examples~~ examples of surface finger-oxides are shown in [Fig. 1](#).

3.1.2 *interparticle oxide networks*—*networks, n*—interparticle oxide networks are continuous or discontinuous oxides that follow prior particle boundaries in powder forged parts. ~~Examples~~ examples of interparticle oxide networks are shown in [Fig. 2](#).

¹ This test method is under the jurisdiction of ASTM Committee B09 on Metal Powders and Metal Powder Products and is the direct responsibility of Subcommittee B09.11 on Near Full Density Powder Metallurgy Materials.

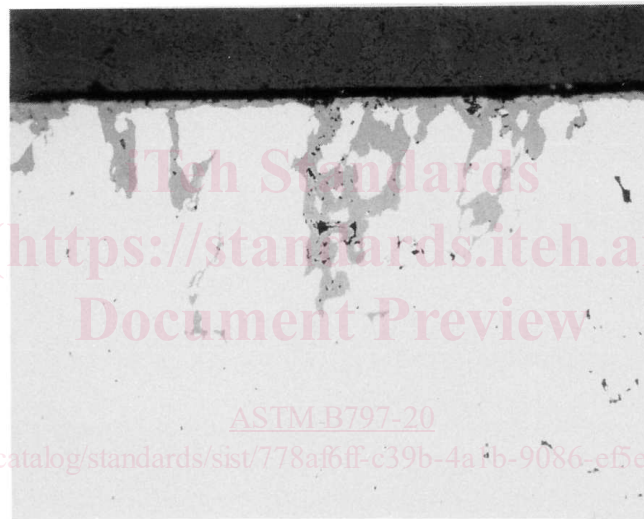
Current edition approved Oct. 1, 2015 Oct. 1, 2020. Published November 2015 October 2020. Originally approved in 1988. Last previous edition approved in 2007 2015 as B797 – 93 B797 – 15. (2007). DOI: 10.1520/B0797-15-10.1520/B0797-20.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard



100X



400X

FIG. 1 Example of Surface Finger-Oxide Penetration Extending Inward from the Powder Forged Part Surface (Shown more clearly at high magnification.)magnification)

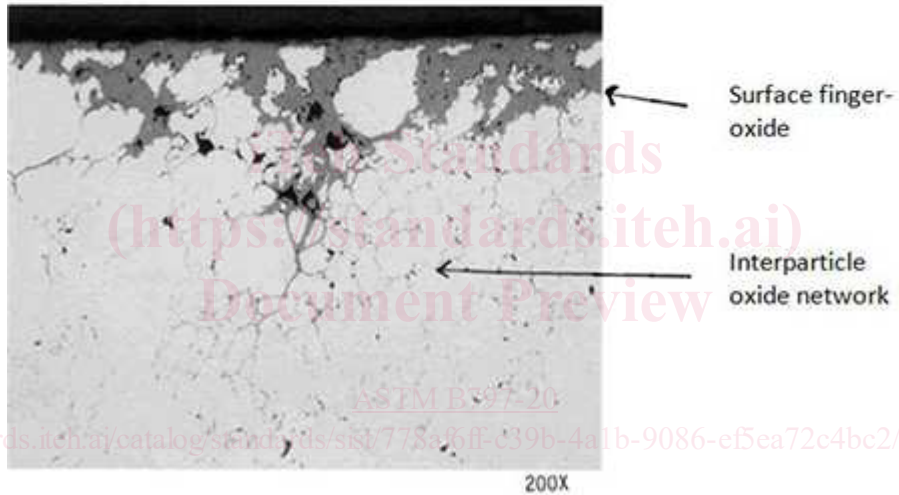
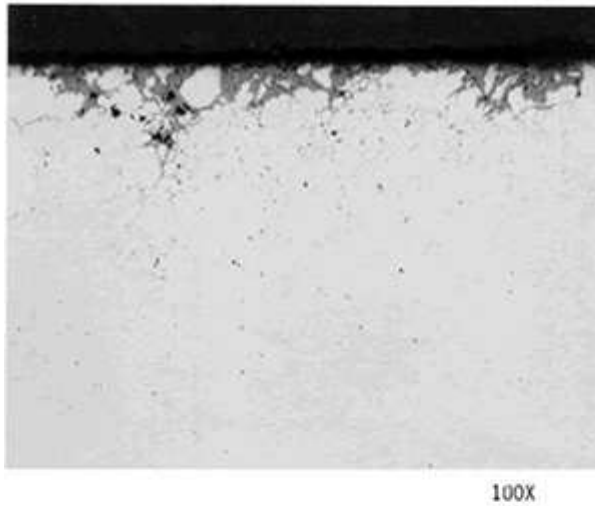


FIG. 2 Example of Interparticle Oxide Networks Within a Powder Forged Part (Shown more clearly at high magnification.)

4. Summary of Test Method

4.1 A section representing both surface and subsurface regions of a critical area is cut from the powder forged part and mounted for metallographic grinding and polishing.

4.2 For surface finger-oxide penetration, the polished and unetched sample is examined microscopically at a magnification of 400 to 500×. The maximum depth of penetration of surface finger-oxides is measured.

4.3 For interparticle oxide network concentration, the polished and unetched sample is examined microscopically at a magnification of 200 to 500× to determine the presence of interparticle oxide networks.

5. Significance and Use

5.1 The presence of surface finger-oxide penetration and interparticle oxide networks are two of the properties used to evaluate powder forged steel parts for proper processing. Maximum acceptable depths of penetration of surface finger-oxide penetration and acceptable concentrations of subsurface interparticle oxide networks depend on the component and its service environment.

5.2 Results of tests may be used to qualify parts for shipment.

6. Apparatus

6.1 Equipment for the metallographic preparation of test specimens.

6.2 A metallographic microscope permitting observation and measurement up to a magnification of 500×.

7. Sampling

7.1 A metallographic specimen shall be removed from the powder forged part to cover each designated critical area. Critical areas shall be defined by the applicable part drawing or the purchaser's purchase order. Specimens shall be taken from the powder forged part in the condition in which it is to be supplied. The polished surface of the specimens shall be parallel to the forging direction, that is, parallel to the direction of travel of the forging punch.

8. Procedure

8.1 *Preparation of Specimens*—In mounting the specimen for grinding and polishing, protection from rounding the edge of the part is essential. In polishing the specimen, it is important that a clean polish be obtained and that edge detail of the part not be destroyed. Specimens shall be examined in the as-polished condition, free of the effects of any prior etching (if used). It is recommended that the procedures described in Methods Guide E3 be followed. Automated grinding and polishing procedures are recommended.

8.2 *Measurement of Surface Finger-Oxide Penetration Depth*—Scan the perimeter of the metallographic specimen, initially at a magnification of 100×, and carefully examine each designated critical area at a higher magnification, for example, 400 to 500×. Measure the maximum depth of penetration of surface finger-oxides from the finished part surface in micrometres for each designated critical area.

8.3 *Measurement of Interparticle Oxide Network Concentration*—Scan the perimeter of the metallographic specimen at a magnification of 100×. Carefully examine each designated critical area at a higher magnification, for example, 200 to 500×. Record the presence of any interparticle oxide networks in the designated critical areas.

9. Report

9.1 The test report shall include the following information:

9.1.1 Identification of the part and location of the test specimen,

9.1.2 The maximum depth of penetration of surface finger-oxides from the finished part surface in micrometres for each designated critical area, and