Quality Standard for Steel Castings and Forgings for Valves, Flanges, Fittings, and Other Piping Components

Magnetic Particle Examination Method

Standard Practice Developed and Approved by the Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, NE Vienna, Virginia 22180-4602 Phone: (703) 281-6613 Fax: (703) 281-6671 E-mail: standards@msshq.org



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FOREWORD

Historically, magnetic particle inspection has been applied to steel castings since the mid-1900's. It became regarded as an aid to the manufacture of steel castings, particularly pressure containing castings, for use in "severe services". The application of magnetic particle inspection had progressed to the point of recognition in 1944, warranting the issuance by ASTM of its method of "Magnetic Particle Testing and Inspection of Commercial Steel Castings", known as ASTM A272-44 (withdrawn in 1945). It had been the practice of manufacturers and users of steel castings to survey castings for the type of defects as revealed by the procedures and to reach agreement on the extent and areas for which this procedure was to be used. There had been no standard establishing a dividing line between acceptable magnetic particle indications and those requiring probing or further exploration.

In the mid-1950's, there was an increasing demand on the part of certain users of steel valves, fittings, and flanges, particularly in the oil refining industry, to establish minimum requirements for freedom from discontinuities of the type revealed by magnetic particle tests. As the demand for such a quality level grew, it has become apparent that some uniform code of acceptance would have to be developed beyond the mere procedure for making the inspection. To this end the ASTM has promulgated ASTM E125, "Reference Photographs for Magnetic Particle Indications on Ferrous Castings". These photographs typify the type, character, and extent of indication relative to the quality definitions embraced in this MSS Standard Practice. The reference photographs were originally obtained by a procedure in accordance with ASTM E109, "Method for Dry Powder Magnetic Particle Inspection", which replaced ASTM A272 in regards to the type of castings covered herein are concerned. Note that ASTM E109 was eventually withdrawn in 1981 and subsequently replaced by ASTM E709.

The original selection of photographs and their interpretation was undertaken by the Steel Founders Society of America and were made available to ASTM Committee E-7 for the purpose of establishing the "Reference Photographs". These reference photographs served a parallel purpose to ASTM E71, "Industrial Radiographic Standards for Steel Castings", originally prepared by the Navy Department's Bureau of Ships as reference for repair and/or acceptance of steel castings upon a basis of radiographic inspections. Thus, the magnetic particle reference photographs were treated as another type of "go-no-go" gage in defining the original criteria established within this MSS Standard Practice. Note that ASTM E71 was withdrawn in 1974 and subsequently replaced by ASTM E446.

The MSS SP-53 was originally approved in January 1957. Complying with MSS SP-53 serves to codify a quality level in cast steel valves, fittings, and flanges involving casting discontinuities to an extent beyond that which may be attained through visual inspection. The quality herein implied is the minimum consideration of safety for the services in which such castings are to be used. There is no implication intended that "visual quality inspection" of steel casting will not fully support the ratings and requirements of ASME B16.5.

The ASTM E125 Reference Photographs were originally adopted at the prompting of a Joint Task Force promoted by Subcommittee 3, of ASA (later known as ANSI) Standards Committee B31, on Refinery Piping Systems; consisting of representatives of ASA, Steel Founders' Society of America (SFSA), ASTM, ASME, and MSS. In addition, the aforementioned Standards Committee B31(developer of the standard known today as ASME B31 or the American National Standard Code for Pressure Piping), involving the section in B31 relating to Refinery Piping Systems, was concerned with pressure castings and expressed interest in MSS SP-53, given its scope and examination applicability. It was then contemplated during this time that MSS SP-53 would be employed by the B31 Refinery group as a "practical vehicle whereby the Pressure Piping Code's safe practice precepts may be exerted over the steel castings used in the manufacture of valves, fittings, and flanges".

This Forward is informational and provides a historical perspective on the subject. MSS acknowledges the original assistance and collaboration involving MSS SP-53 by the supporting members of the former ASA Standards Committee B31 as mentioned above.

PREFACE

Technical Committee Membership

The MSS Technical Committee 304, *Quality Standards*, has primary responsibility for this Standard Practice and included the following members at the time of approval:

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(continued on next page)

iii

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