

# WELDING THE HY STEELS

Issued Under the Auspices of  
American Society for Testing and Materials  
and  
The Defense Metals Information Center

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ASTM Special Technical Publication 494  
List price \$3.50  
04-494000-02

**AMERICAN SOCIETY FOR TESTING AND MATERIALS**  
1916 Race Street Philadelphia, Pennsylvania 19103

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**Library of Congress Catalog Card Number: 72-157308**

**ISBN 0-8031-0073-6**

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**Printed in Alpha, N. J.**

**April 1971**

The American Society for Testing and Materials and the Defense Metals Information Center share a dedication to the more efficient utilization of technical information on metals and their properties. ASTM is the leading society in the promotion of knowledge of materials and the standardization of specifications and methods of testing; DMIC, sponsored by the U. S. Department of Defense and operated by Battelle Memorial Institute, serves the technical community as a major source of information on the advanced metals.

This report is the third cooperative publication of ASTM and DMIC. The first was the ASTM Data Series Publication, "The Elevated-Temperature Properties of Selected Superalloys", DS 7-S1, issued in July, 1968. The Second, "Compilation of Chemical Compositions and Rupture Strengths of Superalloys", DS 9E, was issued in October, 1970.

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### SUMMARY

The principal advantages of the HY-steels are their good combination of strength and toughness over a wide temperature range and their good weldability in heavy sections with little preheat and no postweld heat treatment. This class of steels includes Ni-Cr-Mo steels designated HY-80 and HY-100 and a Ni-Cr-Mo-V steel tentatively designated HY-130. They are low-carbon steels that achieve their strength and toughness through a quenching and tempering heat treatment.

The following welding processes and their proper application to the Hy-steels are discussed: (1) shielded metal-arc welding, (2) submerged-arc welding, (3) gas metal-arc welding, (4) Narrow-Gap welding, (5) gas tungsten-arc welding, (6) plasma arc welding, and (7) electron beam welding.

HY-80 and HY-100 have 80,000 psi and 100,000 psi minimum yield strengths respectively, and very similar chemical compositions. In general, these alloys are considered highly weldable, and their as-welded properties are very good when proper welding procedures are used. HY-130 is a higher alloy quenched-and-tempered steel having a minimum yield strength of 130,000 psi. Development of filler materials for joining HY-130 has been hampered by the difficulty of obtaining the combination of high toughness and high strength required in the as-welded condition.

Heat-affected-zone microcracking and weld- and base-metal delayed cracking have been problems in welding HY-80 and HY-100. These can, however, be controlled by proper melting and processing of the base materials during production and by exercising proper precautions during welding. HY-130 has shown sensitivity to weld-metal contamination by carbon, sulfur, phosphorus, hydrogen, oxygen, and nitrogen.

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