

Heat Treatment Services—Batch Type for Equipment Used in the Petroleum and Natural Gas Industry

API STANDARD 20H
SECOND EDITION, APRIL 2020



AMERICAN PETROLEUM INSTITUTE

Special Notes

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to ensure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be used. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard, and this standard does not limit the responsibility of the manufacturer for ensuring conformance with all applicable requirements of that standard or any API certification program requirements. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

Users of this Standard should not rely exclusively on the information contained in this document. Sound business, scientific, engineering, and safety judgment should be used in employing the information contained herein.

All rights reserved. No part of this work may be reproduced, translated, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. Contact the Publisher, API Publishing Services, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001-5571.

Foreword

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

- the term “shall” denotes a minimum requirement to conform to the standard;
- the term “should” denotes a recommendation or that which is advised but not required to conform to the standard;
- the term “may” is used to express permission or a provision that is optional;
- the term “can” is used to express possibility or capability.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

Contents

	Page
1 Scope	1
1.1 Purpose	1
1.2 Applicability	1
1.3 Heat Treatment Specification Levels (HSLs).....	1
2 Normative References.....	1
3 Terms, Definitions, Acronyms, and Abbreviations	1
3.2 Acronyms and Abbreviations	2
4 Heat Treatment Supplier Qualification.....	3
4.1 General.....	3
4.2 Quality Management System (QMS).....	3
4.3 Minimum Facility Requirements	3
4.4 Qualification Requirements	4
4.5 Heat Treatment Specification Levels.....	4
5 Heat Treatment Facility Capability.....	5
5.1 General.....	5
5.2 Identification and Traceability	6
6 Heat Treatment Equipment Temperature Uniformity Survey (TUS) and Calibration	6
6.1 Calibration	6
6.2 HSL-1 TUS and Instrumentation Requirements	6
6.3 HSL-2 TUS and Instrumentation Requirements	8
6.4 HSL-3 TUS and Instrumentation Requirements	9
6.5 Records	10
7 Heat Treatment Procedures	10
7.1 General.....	10
7.2 Furnace Atmosphere	10
7.3 Process Validation	11
8 Furnace Loading	11
9 Heat Treatment Quench Requirements.....	11
9.1 General Requirements	11
9.2 Water Quench	12
9.3 Oil Quench	12
9.4 Polymer Quench	12
10 Heat Treatment Equipment Maintenance.....	13
11 Heat Treatment of Production Parts	13
11.1 General.....	13
11.2 Manufacturing Process Specification (MPS).....	13
12 Records	14
12.1 General.....	14
12.2 Document Control	14
12.3 Records to be Maintained by Heat Treatment Supplier.....	15

Contents

	Page
12.4 Requirements for Heat Treatment Certificate.....	15
13 Handling, Storage, and Shipping.....	16

Figures

1 Thermocouple Locations—Rectangular Furnace (Working Zone).....	7
2 Thermocouple Locations—Cylindrical Furnace (Working Zone).....	7

Tables

1 Processing Classes and Material Grades	3
2 Minimum Facility Requirements	3
3 Processing Class Qualification Limitations.....	4
4 Batch Heat Treatment Furnace Test Requirements	4
5 HSL-3 Heat Treatment Requirements	9

Introduction

Changes from the First Edition to the Second Edition:

This standard is the result of updating the requirements from API 20H, First Edition. This revision is developed based on input from the technical experts on the API 20H Task Group. The Second Edition moves this standard to a higher level of service for the petroleum and natural gas industry.

Highlights of significant changes between the First and Second Edition, include:

- Removal of typical examples of materials for each processing class listed in Table 1.
- Addition of Quality Management System (QMS) requirements for the heat treatment supplier.
- Removal of Responsibilities and Duties section, considering new QMS requirements.
- Removal of Personnel Training Requirements section, considering new QMS requirements.
- Separation of HSL-1, HSL-2, and HSL-3 furnace survey and calibration requirements for improved clarity.
- Alignment of HSL-1 and HSL-2 instrumentation accuracy and calibration requirements with API 6A.
- Removal of Annex A; migrated contents into Heat Treatment Facility Capability section.
- Record retention changed.
- Allowance for part stacking under specific conditions.
- Improved clarity of Heat Treatment Quench Requirements section.
- Addition of Heat Treatment of Production Parts section.
- Improved clarity of Manufacturing Process Specification (MPS) section for each HSL.
- Improved clarity of Requirements for Heat Treatment Certificate section.

Heat Treatment Services—Batch Type for Equipment Used in the Petroleum and Natural Gas Industry

1 Scope

1.1 Purpose

This standard identifies requirements for heat treatment supplier qualification, processing, identification and traceability, and documentation of heat treatment services for use in the petroleum and natural gas industries when referenced by an applicable equipment specification.

1.2 Applicability

The requirements of this standard apply to batch heat treatment operations that establish or affect the final mechanical properties and include stress relief operations. This standard applies to carbon steel, low-alloy steel, stainless steel, and nickel-base alloys. Case hardening, induction hardening, and flame hardening are not covered by this standard.

NOTE This standard does not limit the responsibility of any manufacturer of commercial products using batch heat treating services and manufactured to an API standard from its responsibility for compliance with all applicable requirements of that API standard.

1.3 Heat Treatment Specification Levels (HSLs)

This standard establishes the requirements for three heat treatment specification levels (HSLs). These HSL designations define different levels of heat treatment technical, quality and qualification requirements.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies.

API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

ISO 9001¹, *Quality Management Systems — Requirements*

SAE AMS2750², *Pyrometry*

3 Terms, Definitions, Acronyms, and Abbreviations

For purposes of this standard, the following terms, definitions, acronyms, and abbreviations apply.

3.1 Terms and Definitions

3.1.1 Conformance criteria

Defined limits placed on characteristics of materials, processes, products, or services.

¹ International Organization for Standardization, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, www.iso.org.

² SAE International, 400 Commonwealth Drive, Warrendale, Pennsylvania 15096, www.sae.org.