



AEROSPACE RECOMMENDED PRACTICE

ARP1962™

REV. C

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Superseding ARP1962B

Training and Approval of Thermal Processing Personnel

RATIONALE

ARP1962C is the result of a Five-Year Review and update of this specification with changes to Title, Definitions (see 2.2.1, 2.2.2, 2.2.4, 2.2.5, and 2.2.6), Training Program (see 3.1), Ancillary Training (see 3.1.1), Personnel Approval Process (see 3.2.1, 3.2.2, and 3.2.3), Table 1, Approval Guidelines (see 3.3 and 3.3.1), Table 2, Evaluation (see 3.3.1.4, 3.3.1.4.2, and 3.3.1.4.5), Approval (see 3.3.2.1 and 3.3.2.2), Records (see 3.3.2.3), Job Classifications (see 3.4, 3.4.1, 3.4.2, and 3.4.3), and Table 3.

1. SCOPE

1.1 Purpose

1.1.1 This SAE Aerospace Recommended Practice (ARP) describes training and approval of personnel performing certain thermal processing and associated operations that could have a material impact on the properties of materials being processed. It also recommends that only approved personnel perform or monitor the functions listed in Table 1.

1.1.2 This document conforms to the general concepts of the training requirements for personnel in ISO 9000.

1.2 Responsibility

The facility employing the thermal processing and associated personnel is responsible for determination of its evaluation program and approval of the individual thermal processor and associated personnel.

1.3 Summary of Requirements

1.3.1 Approved personnel should meet certain requirements of on-the-job training, education, classroom instruction, and evaluation. Some suggested on-the-job training may be substituted by experience and education. Some suggested online or classroom instruction may be substituted by equivalent experience. The company or facility employing the personnel is responsible for determining these substitutions and equivalencies.

1.3.2 This document does not mandate any specific on-the-job training program or specific education or classroom instruction program. It does not require any specific testing or evaluation nor any specific question(s) on the test or evaluation. The ASM International, Heat Treating Society (HTS), and Metal Treating Institute (MTI) training and testing documents described herein are not required by this document; they are provided as sources that the thermal processing facility can obtain and use as needed.

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1.4 Application

This document is applicable to thermal processing of parts, castings, forgings, and fasteners. It is invoked only when cited by another specification, the engineering drawing, or purchase order. This procedure is not applicable for the thermal processing of raw materials, excluding forgings and castings as described above. It is applicable for raw materials thermally processed by an outside vendor, but only when invoked by specification. It is applicable to both thermal processing suppliers and to captive thermal processing departments. It is not applicable to airline maintenance facilities, unless specified.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (U.S. and Canada only) or +1 724-776-4970 (Outside U.S. and Canada), www.sae.org.

AS7766 Terms Used in Aerospace Metals Specifications

2.1.2 Metal Treating Institute (MTI) Publications

Available from Metal Treating Institute, 321 Highway 76, White House, TN 37188, 904-249-0448, www.heat treat.net.

Guidelines for Training and Certification of Heat Treaters

2.1.3 ASM International Publications

Available from ASM International Heat Treating Society, 9639 Kinsman Road, Materials Park, OH 44073, 440-671-3800, www.asminternational.org.

Heat Treating Certificate Program

2.1.4 ANSI Publications

Copies of these documents are available online at <https://webstore.ansi.org>.

ISO 9000 Quality Management Systems - Fundamentals and Vocabulary

2.2 Definitions

Terms used in AMS are defined in AS7766 and as follows:

2.2.1 THERMAL PROCESSING

Any process in which materials are exposed to controlled heating, soaking, or cooling to achieve the specified properties or condition of the material or part. Table 2 lists typical thermal processes.

2.2.2 THERMAL PROCESS PLANNERS

Personnel who are trained to adequately flow down process and testing requirements in order to achieve verifiable results as required by the customer or in-house specification.

2.2.3 MANUFACTURING SEQUENCE PLANNERS

Planners who are only listing step-by-step operations for which the thermal processing details are covered in a more detailed document.

2.2.4 FACILITY

A facility is an individual location where thermal processing is performed and takes responsibility for all processing and testing required for the certification to an AMS thermal process or other thermal processing specification.

2.2.5 CONTRACT REVIEW

The process by which customer requirements are reviewed and corresponding company or facility planning is made to comply with contract requirements.

2.2.6 COMPANY

A company is the organizational ownership of one or more facilities.

3. TECHNICAL REQUIREMENTS

3.1 Training Program

The facility should have a formal written program that defines the progression for education, experience, on-the-job training, classroom instruction/online instruction, proficiency testing, or evaluation for each employee to become approved. In addition, it is recommended for the company to have a documented system for assessing the ability of personnel requiring approval to conduct their respective job functions in an acceptable manner. Such a system would use inspection data, test data, failure data, and other performance or quality metrics that are traceable to the employee's work output. Evidence of deficiencies may trigger consideration of retraining, reevaluation, withdrawing of approval, or not granting reapproval.

3.1.1 Ancillary Training

Consideration may be given to training obtained and evaluations made through the use of academic institutions, industry-managed and recognized second- and third-party training, and evaluation programs with regard to classroom training time, on-the-job training time, and initial and recurrent evaluation of competency.

3.2 Personnel Approval Process

The functions in Table 1 should be performed or monitored by approved personnel who have been specifically documented as approved for each function they perform. Determination of which personnel are approved for which functions is solely the responsibility of the thermal processing company or facility. Personnel may be approved for any or all of these functions.

3.2.1 The functions in Table 1 may be performed by nonapproved supervised personnel who can follow instructions when they are designated by and monitored by an approved person (for the function[s] being monitored). The approved person is responsible for the proper performance of the function. Monitoring should entail either frequent periodic witnessing or verification checking of the function, verification of the accuracy of shop paper, test results, and inspection records, and stamping, initialing, or signing off the shop paper, test results, and inspection records by approved personnel. The frequency of witnessing should be determined by the thermal processing company or facility-approved personnel based on their confidence in the experience and capability of the nonapproved personnel. Monitoring does not imply constant visual contact.

3.2.2 Except as follows, personnel performing associated thermal process functions shall be trained in accordance with Table 1.

- Supervisors in captive thermal processing facilities who are responsible for other activities and whose function in the heat-treat department is only administrative.
- Manufacturing sequence planners (see 2.2.3) in captive thermal processing facilities unless they are preparing detailed thermal processing instructions or procedures.
- Personnel from outside sub-tier suppliers, such as laboratory technicians who perform associated functions.
- Metallurgists, metallurgist equivalent as defined by the facility's internal procedures, and other graduate engineers who have documented records of on-the-job shop training and who have passed the evaluation specified herein. On-the-job shop training for metallurgists and other graduate engineers may be waived with a minimum 6 months of relevant thermal processing experience.

3.2.3 For personnel listed in Table 1, recommended resources for training include, but are not limited to: online/classroom instruction, Continuing Education Unit (CEU), ASM Heat Treat Society Heat Treating Certificate Program (HTCP), MTI Qualified Furnace Operator program (QFO), and MTI Heat Treat Quality Specialist program (HTQS). The "Hours Total" represents all hours suggested as a combined total of all online/classroom training completed for all the applicable job responsibilities listed in Table 1.

Table 1 - Suggested minimum online instruction, classroom instruction, and on-the-job training (OJT)

Function	Online/Classroom/ OJT Instruction Hours ⁽²⁾⁽⁴⁾⁽⁶⁾⁽⁷⁾		CEU/OJT ⁽²⁾⁽³⁾⁽⁶⁾⁽⁷⁾		HTCP Courses ⁽⁵⁾⁽⁶⁾⁽⁷⁾		QFO or HTQS ⁽⁶⁾⁽⁷⁾⁽⁸⁾	
	Online/ Classroom Hours	OJT Months	CEU 8 Hours Total ⁽⁹⁾	OJT Months	Online/ Classroom 20 Hours Total ⁽⁹⁾	OJT Months	Online QFO - 11 Hours HTQS - 25 Hours Total ⁽⁹⁾	OJT Months
Thermal Processes								
Furnace Operator Training								
Verify product cleanliness before and after thermal process	1	6		6		6		6
Load work into and out of furnace ⁽¹⁾	1	6		6		6		6
Set temperature controls	1	6		6		6		6
Set atmosphere and vacuum controls	1	6		6		6		6
Monitor nonapproved personnel	1	6		6		6		6
Rack products	1	6		6		6		6
Determine specific equipment to be used	1	6		6		6		6
Determine or verify temperatures and soak times	1	6		6		6		6
Determine or verify load size	1	6		6		6		6
Verify temperature control settings	1	6		6		6		6
Verify atmosphere and vacuum settings	1	6		6		6		6
Determine and adjust heating and cooling rates	1	6		6		6		6
Verify conformance of indicated and recorded temperatures and times to specified requirements	1	6		6		6		6
Insert, position, and adjust load thermocouples	1	6		6		6		6
Insert, position, and adjust control, indicating, and recording thermocouples	1	6		6		6		6
Approve racking procedure or verify racking if no procedure is established	1	6		6		6		6
Determine or verify when soaking commences (heat-up time, stabilization, etc.)	1	6		6		6		6
Verify quenching medium	1	6		6		6		6
Determine or verify re-temper or re-age temperature and time	1	6		6		6		6
Monitor accuracy of thermal processing log	1	6		6		6		6
Planning/Contract Review Personnel								
Contract review	1	12		12		12		12