161Thorn Hill Road	Program Document HTBOK	PD 6103 HTBoK-011/OW-3 REV A					
Warrendale, PA 15086-7527		Issued 12OCT2015					
		Revised: 11OCT2018					
		Superseding: 12OCT2015					
BODY OF KNOWLEDGE:							
ROLE DESCRIPTION:OwnerSPECIAL PROCESS:Heat TreatmentMETHOD:Performance of Stainless and PH Steel Alloys Requirements							
All PRI Qualification SM program examinations are created using the applicable PRI Qualification SM program Body of Knowledge (BoK), which defines the baseline knowledge and experience required to be considered competent to perform the specified job role in aerospace special process manufacturing.							
All BoKs are created by subject matter experts who participate in the PRI Qualification SM Body of Knowledge Review Boards. All BoKs are updated periodically according to the latest revision of PRI Qualification SM program documentation (PD6100: Industry Managed Special Process Bodies of Knowledge) to ensure consistency with current industry practice.							

1. INTRODUCTION

This document has been created by the PRI QualificationSM program Heat Treat Body of Knowledge Review Board (HT-BoKRB) according to the requirements of PD6100.

This document constitutes the PRI QualificationSM program BoK for Stainless and PH Steels, Owner. It defines the baseline knowledge and experience required to be considered competent to perform this role.

Unless otherwise stated, the HT-BoKRB has followed guidelines as detailed in the current version of International Aerospace Quality Group (IAQG) Guidance PCAP 001 (Competence Management Guideline) to develop this BoK.

The information in this BoK will provide guidance for the following:

- Training providers who wish to develop training courses intended to support PRI QualificationSM program examination candidate preparation
- Heat Treat Examination Review Board (HT-ERB) for the development of PRI QualificationSM program examinations
- Candidates taking PRI QualificationSM program examinations who wish to prepare in advance

2. REFERENCES

PRI QualificationSM program documents:

PD6000	Governance & Administration of PRI Qualification SM ProgramPD6100 Industry Managed
Special Process Bodies	s of Knowledge
PD6200	Industry Managed Special Process Examinations System
IAQG documents:	IAQG Guidance PCAP 001 Competence Management Guideline

3. DEFINITIONS

Definitions described within are specific to the Special Process BoK. For program-specific definitions, please refer to either the PD 6000 or the PRI QualificationSM Dictionary.

BODY OF KNOWLEDGE (BoK): Baseline knowledge and experience required to be considered competent for a target position.

GENERAL EXAMINATION: The General Examination is designed to ascertain the candidate's general knowledge required for a particular job, role or activity. All of the questions will be derived from the corresponding BoK.

EXPERIENCE: The accumulation of knowledge or skill that results from direct participation in events or activities over a period of time.

IN-HOUSE (or IN-SOURCING): Keeping responsibility and control of key or critical processes inside an organization by using available internal resources In house control (Insourcing) is often preferred to ensure compliance of critical with specific customer or statutory requirements – The opposite of Outsourcing

KNOWLEDGE: Information / understanding acquired over a period of time. Information acquired through study and retained over that period of time (education, training, experience etc.) The combination of data and information, to which is added expert opinion, skills and experience, to result in a valuable asset which can be used to aid decision making and problem solving.

LEVEL: A class or division of a group based on education, training and experience. There are 3 levels: Operator/Technician, Planner and Owner. Please refer to the current version of PD 6000 for definitions.

METHOD: A well-defined division of a SPECIAL PROCESS widely recognised by industry. A specific area of a special process for example anodizing within Chemical Processing

NON-SPECIAL PROCESS RELATED REQUIREMENTS: Miscellaneous requirements such as Health and Safety, Environmental, etc.

OUT-SOURCED: is the contracting out of a business process to a third-party (external) supplier. It relates to both product and services

PERSONAL ATTRIBUTES: A quality or characteristic expected and required for a particular job, role or activity.

PRACTICAL EXAMINATION: The Practical Examination shall consist of a demonstration of proficiency in performing tasks that are typical of those to be accomplished in the performance of the candidate's duties. The examination content is derived from the corresponding BoK.

SERVICE PROVIDER: A company or individual that provides a service or product. Service provider is generally used to refer to external or outsourced (third party) suppliers of services and product although large organizations may have Internal Service Providers for example IT. Examples may include Instrument calibration, Periodic Tests (TUS, SAT), analysis or testing which is outside the capability of internal resources. Service providers may also be suppliers of goods for example thermocouples pure gases etc

SKILL: Ability to perform a particular task. The quality of being able to do something that is acquired or developed through training or experience.

SPECIFIC EXAMINATION: The Specific Examination shall cover requirements and use of the specifications, codes, equipment, operating procedures and test techniques the candidate may use in the performance of his/her duties with the employer. Examination content will be derived from the corresponding BoK where applicable.

WEIGHTING: The "weighting" of each line item, using a scale of 1, 3, 7, 10, (1 being least important; 10 being most important) indicates the relative importance of that aspect of the BoK and will determine the likelihood and frequency of a question on that topic appearing in the examination

4. GUIDANCE TO EXAMINATION CANDIDATES

All PRI QualificationSM program examination candidates are recommended to read all documents referenced in section 2 of this document.

As stated in PRI QualificationSM program document PD6200, every exam question shall relate directly to and be derived from the information as detailed in the current version of the BoK.

Re-assessment to this BoK is required every 5 years, unless otherwise specified.

Candidates are therefore advised to ensure familiarity with all aspects of the BoK as detailed in Table 1. This can be done through:

- Self-study
- Completion of internal training
- Completion of external training (a list of Approved Training Providers can be found at https://p-r-i.org/)

Records of all qualified personnel shall be maintained and include:

- Date of Qualification
- Results of Written Exam
- Results of Practical Exam (if applicable)
- Summary of Experience (Owner level only)

5. LEVELS

Level							
	Operator (OP)/Technician(T)	Planner (PL)	Owner (OW)				
Descriptors	For descriptions, please refer to current version of PD6000	For descriptions, please refer to current version of PD6000	For descriptions, please refer to current version of PD6000				
Stainless and Precipitation Hardening Steels - Specific Criteria	Basic Understanding of the specific requirements for HT of Stainless and Precipitation Hardening steel s –including cleaning, loading ,start and end of soak, atmospheres quenching tempering and Refrigeration	In addition to knowing what the Operator does, the Planner must: be able to interpret Customer requirements and convert them into clear Work Instructions at the appropriate level of Operator understanding Manage HT shop that contracts the service provider and reviews reports. Technician must have higher understanding and be able to conduct and analyze output from TUS/SAT testing.	In addition to knowing what the Operator and Planner do, the Owner must: Manage people that perform the work and evaluate and reviews reports; must have knowledge of "how" to run the testing.				
Technical Knowledge	Basic knowledge of the special process, its main processes, methods and tools.	Good level of knowledge in all aspects of the special process, all its processes, methods and tools. Ability to coach others on contents and methods in the context of their workplace.	 High or extensive knowledge in all aspects of the special process, all its processes, methods and tools to assess and validate improvements. Able to contribute to set externally recognized standards. Ability to define contents and methods for using knowledge effectively in influencing and developing international processes. Ability to influence the process with one's knowledge. 				
Experience	Sufficient experience to deal with recurrent activity.	Has enough experience to deal with unforeseen issues.	Wide proven experience of the subject. Is recognized specialist within the special process?				
Personal Attributes	Personal Attributes Takes into consideration behavioral characteristics suc not limited to: team working, communication, direction a purpose, innovation and problem solving, mutual trust a respect, confidentiality and trustworthiness.						
Skills							
Non-Special Process Relat	ted Requirements	Health & Safety, Environmental,					

6. TABLE 1

ROLE DESCRIPTION: Owner SPECIAL PROCESS: Heat Treatment METHOD: Performance of Stainless and PH Steel Alloy Requirements REFERENCE GUIDELINES: Addendum 1 is a list of the International Standards and Reference Documents applicable to Heat Treatment processes

Row #	COMPETENCE	Weight (1,3,7,10)	Exam Type Written/ Practical	Reference Guidelines
	Understands:			
	The basic knowledge of the special processes, methods and tools GENERAL QUALITY SYSTEMS KNOWLEDGE:	7	GEN	400400
1.	Knowledge and understanding of Aerospace Quality systems and compliance.	7	GEN	AS9100 AS9100
2.	Full and complete understanding of internal work instructions as well as industry standards. (see Addendum -1 of this document)	7	GEN	AS9100
3.	Knowledge and understanding of how non-conformance are controlled using tools such as Root Cause Corrective Action and 5 why's.	7	GEN	AS9100
4.	Knowledge and understanding of the need to meet safety compliance requirements as applicable.	10	GEN	AS9100
5.	Knowledge and understanding of the requirements for traceability of calibration to NIST or equivalent agencies for Pyrometry equipment. (In sourced or Out sourced) PYROMETRY	7	GEN	AS9100
6.	Knowledge and understanding of the importance of compliance with all Pyrometry requirements including temperature sensors, instrumentation, thermal equipment, system accuracy tests, and temperature uniformity surveys and including reporting of non-conformance.	7	PRAC	AMS2750
7.	Knowledge and understanding of the importance of producing Work Instructions that are in compliance with Customer requirements and AMS 2750 related to pyrometry and furnace class (uniformity) including, Sensors (thermocouples) Calibration, Instrumentation Class and Type, TUS and SAT.	10	PRAC	AMS2750
	WARNING NOTE – Heat Treatment of Stainless and PH steels shall not be implemented without a prerequisite understanding of the pyrometry requirements which affect these materials types. GENERAL METALLURGICAL KNOWLEDGE RELATED TO HEAT TREATING STAINLESS AND			
	PH STEELS (Applicable to all specifications including AMS 2759 and AMS2769)			
8.	Knowledge and Understanding of the metallurgy of different types of Stainless steels – Austenitic; Martensitic and Precipitation Hardening / Maraging. – and the effect this might have on meeting Customer/Prime requirements	7	GEN	AMS2759/3, AMS2759/4, AMS2759/5
	The ability to clearly define and execute Heat Treatment instructions applied to Stainless and Precipitation Hardening Steels including the following	7	GEN	AMS2759/3, AMS2759/4, AMS2759/5
9.	 Annealing Stress relieving Stabilization (Dimensional) Solution Heat Treating Austenite Conditioning Aging/Precipitation Heat Treating Carbide Solution Treatment (For AM-355) Preheating Hardening (Austenitizing and Quenching) Tempering Low Temperature /Cryogenic treatments 	7	GEN	AMS2759, AMS2769, AMS2759/3, AMS2759/4, AMS2759/5
	Knowledge and understanding of the definitions and importance of terms applicable to Heat Treatment of Stainless and PH Steels	10	GEN	AMS 2759, AMS 2769
10.	 Set temperature (Set Point) Recovery time Heating Start of soak Soak time End of soak Interruptions Quench delay 	7	GEN	AMS 2759, AMS 2769

Temper / Cryogenic delay Protective Coatings Cleaning Cleaning Homogenization (effects on Heat treatment response) Homogenization (effects on Heat treatment response) Homogenization (effects on Heat treatment response) Knowledge and understanding of the need to control the use and application of protective compounds to minimize possible contamination from furnace atmospheres. Coatings must be applied according to Customer / Prime requirements. Knowledge and understanding that equipment and instruments for the heat treatment of stainless and PH steels must be in accordance with AMS2750 and all customer requirements. Knowledge and understanding that tequipment and instruments for the heat treatment of stainless and PH steels must be in accordance with AMS2750 and all customer requirements. Knowledge and understanding that thermal processing equipment including refrigeration equipment must meet the requirements of AMS2750. Furnaces shall have a minimum of Type D instrumentation. Furnace Equipment Knowledge and understanding that Furnace Classes are as defined in AMS2750 and are based on the minimum requirements for temperature uniformity. Unless otherwise specified in the applicable specification, furnace classes shall be as follows: Furnace for tampering or aging/precipitation hardening, austentizing or solution treating, and stress relieving shall be Class 5 (+/- 25°F (14°C)) or better Furnace for tempering or aging/precipitation hardening shall be Class 3 (+/- 15°F (8°C)) or better. CAUTION: Furnace requirements for certain specific materials and processes may be contained in the individual specification. Heating Environment Knowledge and understanding that Classes of Atmospheres are defined in AMS2759 as follows Class A: Argon, hydrogen, helium, nitrogen, nitrogen-hydrogen blends, vacuum, or neutral salt. Nitrogen from dissociated ammonia is not permitted.	D GEN GEN GEN GEN	AMS2759, AMS2759/3, AMS2759/4, AMS2759/5 & AMS-H-6875 AMS2759, AMS2759/3, AMS2759/4, AMS2759/5 & AMS-H-6875 AMS2759 AMS2759 AMS2759
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of heat treated parts are within the limits specified in the AMS2759/3, AMS2759/4 or AMS2759/5, as applicable. Class A Atmospheres, Inert Gas Bulk Delivery	GEN	AMOZYOS
17. Knowledge and understanding that procedures must control that the composition and dew point of 5	GEN	AMS2759
the process gas shall be as required by the individual slash specification and traceable to a certificate of conformance. The dew point of the gas shall be -60 °F (-51 °C) or lower as the gas enters the furnace and shall be verified at least quarterly and also when the piping transmitting the gas is disturbed. In lieu of sampling the dew point at each furnace, the gas may be sampled at the end of each leg of supply piping, at the furthest point from the supply.	GEN	AWIG2733
Servicing and Calibration of Atmosphere Control Equipment		
18. Knowledge and understanding that instrumentation used to control furnace atmosphere shall be calibrated and serviced according to manufacturer's recommendation or by a suitable comparison method assuring the required accuracy is met, and in accordance with heat treater's documented procedures 7 Types of Parts	GEN	AMS2759
 19. Knowledge and understanding that parts shall be controlled by type, as follows, and that they be heat treated in the class of atmosphere permitted for that type. Type 1 - Parts with 0.020 inch (0.51 mm) or more to be removed from all surfaces after heat treatment and parts with hot finished (as-forged, as-cast, or hot mill) surfaces at time of heat treatment with all surfaces to be removed after heat treatment. Type 2 - Parts with finished surfaces, surfaces with less than 0.020 inch (0.51 mm) to be removed after heat treatment (including hot finished surfaces that will remain on the part), or combinations of 	GEN	AMS2759
20. Knowledge and understanding that if part type cannot be determined the part shall be processed as 10 Type 2.	GEN	AMS2759
21. Knowledge and understanding that parts with protective coating on all surfaces shall be processed in an atmosphere that will not destroy the coating during heat treatment. 10	GEN	AMS2759
Quenching Equipment		
22. Knowledge and understanding that the Quench System equipment and quench media shall be 7 sufficient to achieve the properties required by the heat treat process. When quenching in vacuum furnaces using gas quenching, the quenching media and conditions shall be in accordance with AMS2769.	GEN	AMS2759
Auxiliary Equipment		
23. Knowledge and understanding that fixtures and fixture materials shall not cause contamination of 5 parts.	GEN	AMS2759
Sub-Zero Cooling or Deep Freeze		

24.	Knowledge and understanding that when required to complete transformation and provide desired microstructure, parts shall be cooled to a temperature within the range specified in the applicable slash specification, held at the selected temperature for a time commensurate with section	5	GEN	AMS2759
25.	thickness, and warmed in air to room temperature. Knowledge and understanding that cleaning equipment shall be provided to clean parts before heat treatment, to remove oil from parts guenched in oil baths, and salt residue from parts heated or	5	GEN	AMS2759
	quenched in salt baths. When using polymer quenchants, a rinsing system shall be in place to remove quenchant from the parts.			
26.	Knowledge and understanding that vacuum furnaces must meet the requirements of AMS2769. Quenching Media	10	GEN	AMS2759
27.	Knowledge and understanding that when liquid quenching is required, only quenching media as specified in AMS2759/3, AMS327509/4 or AMS2759/5, as applicable may be used.	7	GEN	AMS2759
28.	Knowledge and understanding that oil quenchants shall be in the range of 60 to 160 °F (16 to 71 °C) at the initiation of the quench operation. Oils shall not be used at temperatures exceeding the manufacturer's recommended maximum temperature.	10	GEN	AMS2759
29.	Knowledge and understanding that polymer quenchants shall be in the range of 60 to 110 °F (16 to 43 °C) at the initiation of the quench operation or at a temperature specified by the manufacturer.	7	GEN	AMS2759
30.	Quenching from Salt Bath Furnaces Knowledge and understanding that water shall be monitored to ensure salt content does not exceed 2% by weight and that polymers shall be monitored to ensure salt content does not exceed 6% by weight.	5	GEN	AMS2759
	Quench Effectiveness			
31.	Knowledge and understanding that procedures must specify the frequency and methods for the testing of oil quenchants in accordance with all customer requirements and the records indicate that quenchant effectiveness is consistent and meets specification requirements.	7	GEN	AMS2759
	Polymer Quenchants			
32.	Knowledge and understanding that polymer quenching may only be employed when permitted by the particular specification for the alloy and metal thickness and that records must indicate compliance	7	GEN	AC7102
33.	Knowledge and understanding that the frequency and methods for determining polymer concentration is in accordance with specification and customer requirements. Salt Baths	5	GEN	AC7102
34.	Knowledge and understanding that composition and maintenance of salt baths shall be such as to	10	GEN	AMS2759
34.	prevent contamination of the parts including carburization, decarburization, nitriding, and intergranular attack requirements. Salt baths shall be tested in accordance with AMS2759	10	GEN	AC7102
05	Heat Treatment	40		AM00750
35.	Knowledge and understanding that heat treatment must be in accordance with AMS2759/3, AMS2759/4 or AMS2759/5 for the required material and process. In case of conflict between AMS2759 and the slash specification, the slash specification shall take precedence.	10	GEN	AMS2759
20	Cleaning	7	GEN	AMS2759
36.	Knowledge and understanding that parts shall be in a clean condition before heat treatment. Parts shall be visually inspected to verify freedom from grease, dirt, oil, corrosion and corrosion preventive coatings. All salt residue shall be removed from parts processed in salt baths or quenched in brine. NOTE: It is the responsibility of the purchaser to supply clean parts to the processor or specify the	1	GEN	AWI32739
37.	cleaning method prior to heat treatment to the processor Knowledge and understanding that following heat treatment operations, parts shall be cleaned when	7	GEN	AMS2759
	specified. Post heat treat cleaning is not required unless specified. General Cleaning			AC7102
38.	Knowledge and understanding that when mandatory cleaning requirements are imposed by purchase order or applicable specification, they are complied with by the heat treater or performed by the customer prior to and after heat treatment and that compliance documented. There must be provisions for inspection prior to heat treatment when inspection or conditional cleaning is specified in the applicable specification	7	GEN	AC7102
39.	Knowledge and understanding that for vacuum heat treatment, parts, fixtures, and materials charged into the heating chamber shall be free of contaminants which might evaporate and react with the material being heat treated or the furnace components. Handling of cleaned parts and fixtures shall be such as to prevent contamination prior to charging into the furnace.	7	GEN	AMS2769
40.	Racking Knowledge and understanding that parts must be racked and supported, or otherwise oriented to ensure access of the heating, cooling, and quenching media to all surfaces of all parts and to minimize warpage.	7	GEN	AMS2759
41.	Knowledge and understanding that there must be internal procedures, racking sketches, or other means to ensure that spacing between the parts is adequate for circulation of the heating medium and coolant/quenchant as required by the specifications and records to indicate that these	7	GEN	AC7102
42.	procedures are followed Knowledge and understanding that any specially designed racks and fixtures must be identified and	5	GEN	AC7102
	their condition monitored and documented. Specific fixtures or racks must used for the specific parts for which they are designed.			
43.	Knowledge and understanding that racks/fixtures/baskets must be examined for integrity, and repaired or scrapped as necessary and records must indicate that the procedures are followed	5	GEN	AC7102
	Purging			

44.	Knowledge and understanding that whenever active atmosphere types (e.g., neutral, carburizing, nitriding) are changed and when the prior atmosphere can have a deleterious effect on the subsequent parts being processed, prior to heating of parts, remnants of the previous atmosphere shall be removed from the furnace or retort and gas supply lines. For atmosphere furnaces, this shall be accomplished by purging with at least 5 volume changes of the purge gas or for a sufficient time, flow rate and temperature as verified by testing. For vacuum furnaces or atmosphere furnace's typical lowest vacuum level. NOTE: This requirement does not apply to Type 1 parts or if the heat treater has documented confirmation that material removal after heat treatment will ensure that all surfaces of finished parts will be free from contamination.	10	GEN	AMS2759 AC7102
	Loading		1	
45.	Knowledge and understanding that parts must not be loaded into a furnace with the temperature higher than the set temperature, unless load thermocouples are attached to the part to ensure the part temperature does not exceed the set temperature. Set Temperature	7	GEN	AMS2759
46.	Knowledge and understanding that control instrument(s) shall be set at the temperature specified by AMS2759/3, AMS2759/4 or AMS2759/5 as applicable.	7	GEN	AMS2759
	Heat Treatment in Vacuum Furnaces			
47.	Knowledge and understanding that cleaning of parts, tooling and baskets must be by methods and with materials that ensure freedom from contamination during vacuum heat treating	7	GEN	AC7102
48.	Knowledge and understanding that internal procedure, photographic evidence, or other documentation must specify placement of load thermocouples, racking of parts, and furnace loading	5	GEN	AC7102
49.	Knowledge and understanding that vacuum furnaces must meet the requirements of AMS 2769 and Customer / Prime specifications and be capable of achieving the vacuum levels and leak rates specified.	7	GEN	AMS2769
50.	Knowledge and understanding of the requirement to carry out regular contamination checks for which representative test coupons must be available and analyzed with results being documented. Knowledge and understanding of quality system requirements should the results fail to meet requirements.	7	GEN	AMS2769
51.	Knowledge and understanding of requirements to check condition of door and other seals (e.g. thermocouple entry ports) which must be clean and free from damage or tears. Also understanding of the requirements for cleaning and greasing different types of sealing material which must be documented on work instructions, the traveler / data card, or in specific internal instructions.	5	GEN	AMS2769
52.	Knowledge and understanding of the need for documenting repairs or changes of seals particularly on doors, thermocouple entry ports and gauges.	5	GEN	AMS2750
53.	Soak Knowledge and understanding of why adherence to set temperatures and furnace uniformity is critical and must be clearly conveyed to operators.	10	GEN	AMS2759
54.	Knowledge and understanding of requirements for start and end of soak in accordance with specification requirements. Quench	10	GEN	AMS2759
55.	Knowledge and understanding that quench mechanisms (manual or automated) must be capable of meeting the maximum quench delay if required by Customer / Prime specifications and results recorded and verified for each individual load	7	GEN	AC7102
56.	Knowledge and understanding that the temperature of quench media must be controlled and documented in accordance with Customer / Prime requirements.	10	GEN	AC7102
57.	Knowledge and understanding that records must demonstrate that quench media has been at the specified temperature before, during and after the parts were quenched.	7	GEN	AC7102
58.	Knowledge and understanding of the requirement to verify that agitation of quench media or the parts during quenching conforms to applicable specifications. Gas Quenching in Vacuum furnaces	5	GEN	AC7102
59.	Knowledge and understanding of requirements for selection of quench gas type (e.g. Nitrogen/Argon/Helium), gas pressure during quench, and cooling direction	7	GEN	AMS2769
60.	Knowledge and understanding of how to check cooling rates on gas quenching when there are specific requirements.	5	GEN	AMS2769
64	Low Temperature Treatment when Required by Specification	40	CEN	407400
61.	Knowledge and understanding of the importance of meeting the maximum permitted process delays between Quench/Temper and Quench/Freeze/Temper, and the effect exceeding the requirement might have on the mechanical properties of the product. Planning must include that in-process delay times are recorded and subject to review if they are exceeded.	10	GEN	AC7102
62.	Knowledge and understanding that records must show that cooling after quench is in compliance with customer requirements specified in procedures or shop planning.	7	GEN	AC7102
63.	Knowledge and understanding of time/temperature limits for sub-ambient/subzero treatments	7	GEN	AC7102
64.	Knowledge and understanding of the requirement to record the temperature in each refrigeration cycle to allow verification against Customer / Prime requirements	7	GEN	AC7102
65.	Records Knowledge and understanding of the need for collection of the appropriate data so that a furnace log, or equivalent documentation such as shop travelers, traceable to temperature recorder chart(s), shall be maintained.	10	GEN	AMS2759
	Qualification			

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7.3. I Knowledge and understanding that acceptance testing and documentation must be as specified in 1 / 1 GEN AMS2759		 Unless specified that at least 0.020 inch (0.51 mm) will be removed from all surfaces of parts, the heat treating processor shall heat treat the parts as if less than 0.020 inch (0.51 mm) will be removed. Parts that will be machined after heat treatment, but that will have less than 0.020 inch (0.51 mm) of metal removed from any machined surface may be reclassified as Type 1, by the purchaser and need not meet the requirements as heat treated. Each furnace load shall contain test specimens of the same alloy family as the parts. The surface contamination requirements also apply to the cumulative effects of operations such as normalizing followed by austenitizing or austenitizing followed by reaustenitizing. For reheat treatments, the original specimen or a portion thereof shall accompany the parts and be tested after the reheat treatment. Parts that will have all contamination removed shall not require testing. Strength Ranges Knowledge and understanding that when only a minimum tensile strength is specified and the heat treating processor has the option of selecting the tempering or aging temperature, the process and inspections must be controlled so that maximum tensile strength levels up to and including 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that maximum tensile strength levels over 260 ksi (1793 MPa) minimum.			
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		 Unless specified that at least 0.020 inch (0.51 mm) will be removed from all surfaces of parts, the heat treating processor shall heat treat the parts as if less than 0.020 inch (0.51 mm) will be removed. Parts that will be machined after heat treatment, but that will have less than 0.020 inch (0.51 mm) of metal removed from any machined surface may be reclassified as Type 1, by the purchaser and need not meet the requirements as heat treated. Each furnace load shall contain test specimens of the same alloy family as the parts. The surface contamination requirements also apply to the cumulative effects of operations such as normalizing followed by austenitizing or austenitizing followed by reaustenitizing. For reheat treatments, the original specimen or a portion thereof shall accompany the parts and be tested after the reheat treatment. Parts that will have all contamination removed shall not require testing. Strength Ranges Knowledge and understanding that when only a minimum tensile strength is specified and the heat treating processor has the option of selecting the tempering or aging temperature, the process and inspections must be controlled so that maximum tensile strength levels up to and including 260 ksi (1793 MPa) minimum and 25.0 ksi (172 MPa) above minimum for strength levels over 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that the minimum tensile strength levels over 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that the maximum strength shall be 30.0 ksi (207 MPa) above the specified minimum.			
	72.	 Unless specified that at least 0.020 inch (0.51 mm) will be removed from all surfaces of parts, the heat treating processor shall heat treat the parts as if less than 0.020 inch (0.51 mm) will be removed. Parts that will be machined after heat treatment, but that will have less than 0.020 inch (0.51 mm) of metal removed from any machined surface may be reclassified as Type 1, by the purchaser and need not meet the requirements as heat treated. Each furnace load shall contain test specimens of the same alloy family as the parts. The surface contamination requirements also apply to the cumulative effects of operations such as normalizing followed by austenitizing or austenitizing followed by reaustenitizing. For reheat treatments, the original specimen or a portion thereof shall accompany the parts and be tested after the reheat treatment. Parts that will have all contamination removed shall not require testing. Strength Ranges Knowledge and understanding that when only a minimum tensile strength is specified and the heat treating processor has the option of selecting the tempering or aging temperature, the process and inspections must be controlled so that maximum tensile strength levels up to and including 260 ksi (1793 MPa) minimum and 25.0 ksi (172 MPa) above minimum for strength levels over 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that the maximum strength shall be 30.0 ksi (207 MPa) above the specified minimum. Acceptance tests Knowledge and understanding that acceptance testing and documentation must be as specified in the AMS2759/3, AMS2759/4 or AMS2759/5, as applicable	5	GEN	AMS2759
	72. 73.	 Unless specified that at least 0.020 inch (0.51 mm) will be removed from all surfaces of parts, the heat treating processor shall heat treat the parts as if less than 0.020 inch (0.51 mm) will be removed. Parts that will be machined after heat treatment, but that will have less than 0.020 inch (0.51 mm) of metal removed from any machined surface may be reclassified as Type 1, by the purchaser and need not meet the requirements as heat treated. Each furnace load shall contain test specimens of the same alloy family as the parts. The surface contamination requirements also apply to the cumulative effects of operations such as normalizing followed by austenitizing or austenitizing followed by reaustenitizing. For reheat treatments, the original specimen or a portion thereof shall accompany the parts and be tested after the reheat treatment. Parts that will have all contamination removed shall not require testing. Strength Ranges Knowledge and understanding that when only a minimum tensile strength is specified and the heat treating processor has the option of selecting the tempering or aging temperature, the process and inspections must be controlled so that maximum for strength levels up to and including 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum for strength levels over 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that maximum tensile strength levels over 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that the maximum strength shall be 30.0 ksi (207 MPa) above the specified minimum. Acceptance tests Knowledge and understanding that acceptance testing and documentation must b	5	GEN GEN	AMS2759 AMS2759
	72.	 Unless specified that at least 0.020 inch (0.51 mm) will be removed from all surfaces of parts, the heat treating processor shall heat treat the parts as if less than 0.020 inch (0.51 mm) will be removed. Parts that will be machined after heat treatment, but that will have less than 0.020 inch (0.51 mm) of metal removed from any machined surface may be reclassified as Type 1, by the purchaser and need not meet the requirements as heat treated. Each furnace load shall contain test specimens of the same alloy family as the parts. The surface contamination requirements also apply to the cumulative effects of operations such as normalizing followed by austenitizing or austenitizing followed by reaustenitizing. For reheat treatments, the original specimen or a portion thereof shall accompany the parts and be tested after the reheat treatment. Parts that will have all contamination removed shall not require testing. Strength Ranges Knowledge and understanding that when only a minimum tensile strength is specified and the heat treating processor has the option of selecting the tempering or aging temperature, the process and inspections must be controlled so that maximum for strength levels up to and including 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum for strength levels over 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that maximum tensile strength levels over 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that the maximum strength shall be 30.0 ksi (207 MPa) above the specified minimum. Acceptance tests Knowledge and understanding that acceptance testing and documentation must b	5	GEN GEN	AMS2759 AMS2759 AMS2759
AN400700	2.	 Unless specified that at least 0.020 inch (0.51 mm) will be removed from all surfaces of parts, the heat treating processor shall heat treat the parts as if less than 0.020 inch (0.51 mm) will be removed. Parts that will be machined after heat treatment, but that will have less than 0.020 inch (0.51 mm) of metal removed from any machined surface may be reclassified as Type 1, by the purchaser and need not meet the requirements as heat treated. Each furnace load shall contain test specimens of the same alloy family as the parts. The surface contamination requirements also apply to the cumulative effects of operations such as normalizing followed by austenitizing or austenitizing followed by reaustenitizing. For reheat treatments, the original specimen or a portion thereof shall accompany the parts and be tested after the reheat treatment. Parts that will have all contamination removed shall not require testing. Strength Ranges Knowledge and understanding that when only a minimum tensile strength is specified and the heat treating processor has the option of selecting the tempering or aging temperature, the process and inspections must be controlled so that maximum for strength levels up to and including 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum for strength levels over 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that maximum tensile strength levels over 260 ksi (1793 MPa) minimum. Knowledge and understanding that when both the minimum tensile strength and the tempering temperature are specified, the process and inspections must be controlled so that the maximum strength shall be 30.0 ksi (207 MPa) above the specified minimum. Acceptance tests Knowledge and understanding that acceptance testing and documentation must b	5	GEN GEN	AMS2759 AMS2759

75.	Knowledge and understanding that there must be a process to ensure that periodic testing is performed per procedures and the customer requirements and in accordance with AMS2759 and AMS2769.	5	GEN	AMS2759 AMS2769
	Surface Contamination Testing			
76.	 Knowledge and understanding that internal testing procedures must cover the following: Partial decarburization Total decarburization Carburization 	5	GEN	AC7102
	IGO/IGA (Inter Granular Oxidation/Inter Granular Attack) test			
77.	Knowledge and understanding that there must be a system in place to ensure that decarburization tests are performed at the proper frequency, whether it is periodic or with the load Additional Periodic Tests	5	GEN	AC7102
70		-		AM00750
78.	Knowledge and understanding that periodic tests must be as specified in AMS2759/3, AMS2759/4 or AMS2759/5, as applicable. The following requirements are equipment periodic tests and shall be performed at the frequency specified herein on each piece of equipment in service. Weekly Salt content monitoring of water and polymer quenchants when quenching from salt bath furnaces Quarterly	5	GEN	AMS2759
	Quench system monitoring			
	Semi-Annually			
	Quench media cooling rate determination			
	Preproduction Tests			
79.	Knowledge and understanding that all periodic tests are preproduction tests and shall be performed prior to the first production run.	10	GEN	AMS2759
	Sampling and Testing	7		1100750
80.	Knowledge and understanding that frequency of hardness testing shall be in accordance with AMS2759 or other applicable requirements. NOTE : When hardness testing would be destructive or impractical to accomplish, the method for verification of correct heat treatment shall be as specified by the cognizant engineering or quality engineering organization	7	GEN	AMS2759
81.	Knowledge and understanding that after final operation (hardening and tempering, aging, etc.), every part must be hardness tested unless statistical sampling is authorized by the cognizant quality assurance organization or when parts are subjected to 100% testing after thermal processing subsequent to final hardening operation.	10	GEN	AMS2759
82.	Knowledge and understanding that when heat treating standard components, such as nuts and bolts, for which the frequency of testing is specified, the requirements of the component specifications take precedence.	3	GEN	AMS2759
83.	Knowledge and understanding that unless otherwise specified, the test location shall be the thickest or heaviest section of the part.	7	GEN	AMS2759
84.	Knowledge and understanding of the need to provide for the collection of data necessary to comply with specification and customer requirements for Logs, Records and Reports/Certification.	5	GEN	AMS2759
85.	Knowledge and understanding that parts susceptible to corrosion (e.g., martensitic stainless steels) shall be protected from corrosion during processing and storage. Process Verification	5	GEN	AMS2759
86.	Knowledge and understanding that each heat treatment cycle is reviewed for job traceability, correct temperature, time at temperature and all other related parameters and that this review is documented	10	GEN	AC7102
87.	Knowledge and understanding that this review must be performed by Quality Assurance, other designated personnel, or self-inspected by an automated computer control and monitoring system	7	GEN	AC7102
	REQUIREMENTS SPECIFIC TO PRODUCT PROCESSED IN ACCORDANCE WITH SPECIFIC AMS STANDARDS DESCRIBED ABOVE (Competence)			
	A) SPECIFIC REQUIREMENTS RELATED TO THE PROCESSING OF : Precipitation-			
88.	Hardening Corrosion-Resistant and Maraging steel parts AMS 2759/3 Knowledge and understanding that this specification establishes the heat treatment of PARTS manufactured to the specification above.	7	GEN	AMS2759/3
89.	Knowledge and understanding that this specification applies to those materials listed. Parts made from steels other than those specified in this specification may be heat treated in accordance with the applicable requirements herein using processing temperatures, times, and other parameters recommended by the material producer unless otherwise specified by the purchaser.	7	GEN	AMS2759/3
	PYROMETRY			
90.	Knowledge and understanding of the requirements of AMS2759 and AMS 2750 (Pyrometry).	7	GEN	AMS2759/3
91.	 Knowledge and understanding that equipment must conform to the Furnace Class requirements of AMS2750 as listed below: a) Furnaces used at temperatures of 1400 °F (760 °C) and higher and for stress relieving: Class 5.+/- 25°F (14°C) b) Furnaces used at temperatures from 1300 to 1375 °F (704 to 746 °C): Class 3. +/- 15°F (+/-8°C) 	7	GEN	AMS2759/3
	 c) Furnaces used at temperatures below 1300 °F (704 °C): Class 2.+/- 10°F (+/- 6°C) d) Furnaces shall have a minimum of type D instrumentation in accordance with AMS2750. 			

	Heating environment / Atmospheres	_	0.511	1100770/0
92.	Knowledge and understanding that atmospheres must be controlled such that they do not contaminate parts being treated. Parts being heat treated shall be suitably isolated from products of	7	GEN	AMS2759/3
	combustion. Materials that could attack or contaminate metal shall not contact parts during heat treatment.			
93.	Knowledge and understanding that furnaces used to heat treat other classes of steel using atmospheres that could contaminate precipitation-hardening, maraging, or secondary hardening	7	GEN	AMS2759/3
	steel parts, such as endothermic, exothermic, carbon-containing nitrogen-base, etc., shall have purge cycle run and then shall be tested to ensure that the surfaces of parts are not contaminated			
04	beyond the limits specified. Knowledge and understanding that composition and maintenance of salt baths shall be such as to	7		AMS2759/3
94.	prevent contamination of the parts. Salt baths shall be in accordance with AMS2759. Heating Environment	1	GEN	AM52759/3
95.	Knowledge and understanding of the following	10	GEN	AMS2759/3
35.	Type 1 parts shall be heat treated in air or protective atmosphere.	10	GLIN	AW62759/5
	 Type 2 parts shall be heat treated in air or protective atmosphere when heating at or 			
	below 1450 °F (788 °C), and shall be heat treated in a protective atmosphere when heating above 1475 °F (802 °C).			
96.	Knowledge and understanding that acceptable protective atmospheres shall be in accordance with	7	GEN	AMS2759/3
	AMS2759, and are limited to helium, argon, hydrogen, neutral salt, nitrogen, nitrogen-hydrogen			
	blends, and vacuum in accordance with AMS2769. For scale-free or discoloration-free parts, air			
07	atmospheres and air cooling should be avoided.	7		AM00750/0
97.	 Knowledge and understanding of the following Nitrogen and nitrogen-hydrogen blends are permitted below 1475 °F (802 °C). 	7	GEN	AMS2759/3
	 Nitrogen and nitrogen-hydrogen blends are permitted below 1475 °F (802 °C). Nitrogen and nitrogen-hydrogen blends are permitted at or above 1475 °F (802 °C) for 			
	Type 1 parts only.			
	 Nitrogen and nitrogen-hydrogen blends are permitted up to 1975 °F (1079 °C) as a 			
	backfill quench for vacuum furnaces.			
	The use of nitrogen from dissociated ammonia is prohibited.			
	Coatings			
98.	Knowledge and understanding that a supplemental coating is permitted to minimize oxidation of	7	GEN	AMS2759/3
	parts heated in air.			
99.	Cleaning Knowledge and understanding that cleaning shall be in accordance with AMS2759.	7	GEN	AMS2759/3
100.	Knowledge and understanding that all PH steel parts with any finish machined surfaces are handled	7	GEN	AC7102
100.	with clean gloves after cleaning	,	0LIN	101102
	Soaking			
101.	Knowledge and understanding that Start of Soak shall be in accordance with AMS2759. When a	10	GEN	AMS2759/3
	load thermocouple is used it shall be in contact with the thickest cross-section within each furnace			
	load.			
102.	Start of Soaking When only furnace control sensors are used, soaking time starts when the temperature	10	w	AMS2759
102.	indicated by the furnace control instrument recovers to within 5 °F (3 °C) of the set heat	10		AM02739
	treating temperature.			
	When furnace control sensors and recording thermocouples are used, soaking time starts			
	when the temperature indicated by all recorded sensors reaches the minimum of the			
	required temperature tolerance applicable to the set heat treating temperature.			
	When load thermocouples are used, soaking time commences when the part temperature reaches the minimum of the required temperature tolerance for the set heat treating temperature.			
	Preheating and Normalizing of Secondary Hardening Grades			
103.	Knowledge and understanding that parts should be preheated at 1200 to 1250 °F ± 25 °F (649 to	5	GEN	AMS2759/3
	677 °C ± 14 °C) for a minimum of 30 minutes before normalizing or solution annealing. Normalizing			
	shall be accomplished by heating to the temperature specified, soaking for the time specified, and			
	cooling in air or a protective atmosphere to ambient temperature.			
104.	Annealing of Secondary Hardening Grades Knowledge and understanding that annealing shall be accomplished by heating to the temperature	5	GEN	AMS2759/3
104.	and soaking for the time specified, and cooling in air or a protective atmosphere to ambient	5	GEN	AIVIOZ / 09/0
	temperature.			
	Re-Solution of Secondary Hardening Grades			
105.	Knowledge and understanding that re-solution treatment shall be accomplished by heating to the	5	GEN	AMS2759/3
	required temperature and soaking for the time specified.			
	When reworking material (e.g., material with low hardness and/or mechanical properties, equipment			
	malfunctions, interrupted cycles beyond specified limits, normalizing and annealing are not required before re-solution as long as the solution temperature has not been exceeded.			
	Solution Heat Treating (Solution Annealing), Austenite Conditioning, and Aging			
	(Precipitation Heat Treating)			
106.	Knowledge and understanding that these processes shall be accomplished by heating to the	7	GEN	AMS2759/3
	temperature specified, soaking for the time specified, and cooling as specified. Times for low			
	temperature processes (90 °F (32 °C) and below) are cumulative. When a strength or hardness			
	range not listed in AMS2759/3 is called out by customer purchasing documents, process the parts at			

	the times and temperatures appropriate to achieve the desired properties. Gas quenching in a			
	vacuum furnace is acceptable when an air cool is specified in AMS2759/3.			
407	Aging Cycle Interruption		0511	1100750/0
107.	Knowledge and understanding that If the aging cycle is interrupted due to power loss or furnace	7	GEN	AMS2759/3
	malfunction that causes the furnace temperature to drop below the required setpoint tolerance, the aging cycle can be continued to complete the required soak time. For example, if power is lost 1			
	hour and 20 minutes into a 4 hour age cycle, the parts can be re-heated to the aging temperature			
	and aged for 2 hours and 40 minutes in order to complete the 4 hour age. In no cases can the			
	cumulative aging time exceed the maximum time tolerance (for example, 4 hour ages allow +30			
	minutes, the cumulative aging time cannot exceed 4 hours and 30 minutes). Only one such			
	interruption is allowed per aging cycle. Further interruptions or exceeding the aging time tolerance			
	require reworking via re-solution treatment.			
	Re-solution heat treatment			
108.	Knowledge and understanding that Re-Solution Heat Treating is required in the following cases:	7	GEN	AMS2759/3
	Material previously heat treated to the H1150M condition.			
	Material previously heat treated to a lower strength/hardness.			
	Material with low hardness or mechanical properties, equipment malfunctions, interrupted			
	cycles exceeding allowable limits.			
	Stress relieving			
109.	Knowledge and understanding that Stress relieving, if required, shall be performed in accordance	7	GEN	AMS2759/3
	with AMS2759/11.			
110	Carbide solution treatment for AM-355	_	0.511	
110.	Knowledge and understanding that when required, carbide solutioning shall be accomplished by	7	GEN	AMS2759/3
	heating to 1900 °F (1038 °C), soaking for the specified times for the respective section thickness, water guarding to reacting to cooling to 20° °E (68 °C) or colder, holding for a minimum of			
	water quenching to room temperature, cooling to -90 °F (-68 °C) or colder, holding for a minimum of 3 hours and warming in air to room temperature			
	3 hours, and warming in air to room temperature Straightening			
111.	Knowledge and understanding that straightening may be accomplished at ambient temperature,	7	GEN	AMS2759/3
	during aging, or after aging by heating to not higher than 50 °F (28 °C) below the final aging		JEN	AW02738/3
	temperature. Straightening performed after aging shall be followed by stress relieving			
	Properties			
112.	Knowledge and understanding of the following property requirements	7	GEN	AMS2759/3
	Hardness - Parts shall conform to the hardness ranges stated for the required condition.			
	Tensile - Tensile properties shall conform to those stated in AMS2759/3 for the following alloys and			
	conditions. If no properties are listed for a given material and condition then the tensile properties			
	shall conform to those specified by the applicable material specification.			
	AM 350 and AM 355 parts			
	17-7 PH and PH 15-7 Mo parts heat treated to an RH Condition			
	 15-5 PH and 17-4 PH parts heat treated to the H1100 and H1150 Conditions, excluding 			
	the H1150M condition. Surface Contamination			
113.	Surface Contamination Surface Contamination for Precipitation Hardenable and Maraging Steels	7	GEN	AMS2759/3
115.	Knowledge and understanding that	'	GEN	AW62739/3
	When any surface of a part is not to be machined after heat treatment, the protective			
	atmosphere or backfill medium in furnaces for heating parts above 1450 °F (788 °C) shall			
	be controlled to not produce carburization or nitriding and intergranular oxidation shall not			
	exceed 0.0007 inch (0.018 mm). Parts heat treated in salt baths shall be free of residual			
	salts.			
	 Unless specifically informed that the parts will be machined all over, the heat treating 			
	processor shall process the parts as though some surfaces will not have subsequent			
	metal removal, and therefore shall heat treat above 1450 °F (788 °C) with controlled			
	atmosphere that will conform to the surface contamination requirements. Unless specified,			
	controlled atmosphere is not required for parts with only raw material surfaces, except those made from sheet or strip.			
	 Furnaces used exclusively to heat treat parts which will have all contamination removed 			
	shall not require testing.			
114.	Knowledge and understanding that Surface Contamination for Secondary Hardening Steels shall be	5	GEN	AMS2759/3
	tested in accordance with AMS2759/2.			
115.	Test Methods	7	GEN	AMS2759/3
	Knowledge and understanding that testing shall be carried out in accordance with AMS 2759.and as			
	follows			
	Surface Contamination			
	Precipitation Hardenable and Maraging Grades - Testing shall be by metallurgical			
	examination between 400 and 600X magnification of etched specimens prepared in			
	accordance with ASTM E3. The chord method in ARP1820 may be used to enhance this			
	examination.			
	 Secondary Hardening Grades - Testing shall be performed in accordance with the surface contamination requirements of AMS2759/2 			
116.	contamination requirements of AMS2759/2. QUALITY ASSURANCE PROVISIONS	7	GEN	AMS2759/3
110.		1	GEN	AW32739/3

	Knowledge and understanding that he responsibility for inspection, classification of tests, sampling and testing, approval, records, record retention and report/certification shall be in accordance with AMS2759 and as follows. Acceptance Tests			
	Hardness and tensile are acceptance tests and shall be performed on each lot of parts. In the event of conflict between hardness and tensile properties, parts shall not be rejected on the basis of hardness if the tensile properties are acceptable when determined on specimens taken from the			
	same heat and load. Periodic Tests			
	Surface contamination is a periodic test and shall be performed on each piece of equipment after the purging of atmospheres whenever the heat treat equipment has been used previously with atmospheres, such as endothermic exothermic, carbon-containing nitrogen-base, etc., that could exot a supervised previously treated by the performance of the performan			
	contaminate precipitation-hardening or maraging steels. Preproduction Tests Surface contamination is a preproduction test and shall be performed prior to any production heat treating for each piece of equipment and for each type of atmosphere to be used in each furnace.			
117.	Knowledge and understanding that sampling and testing must be carried out in accordance with AMS 2759.and as follows	7	GEN	AMS2759/3
	 For AM 350 and AM 355 Parts - One or more tensile samples shall be processed with 			
	each austenite-conditioning load. It shall be of the same alloy designation as the parts and shall continue with the parts through final aging.			
	 For 17-4 PH and 15-5 PH parts heat treated to the H1100 and H1150 conditions, excluding the H1150M condition - One or more tensile samples shall be processed with each aging load. It shall be of the same alloy designation as the parts. (H1100 and H1150 			
	parts exhibiting tensile properties lower than required may be re-solution treated and precipitation hardened. A precipitation hardening temperature of up to 100 °F (56 °C) less			
	than originally employed may be used, but in no instance shall a time less than 4 hours be employed. Parts not meeting tensile requirements under these conditions are not acceptable and shall be rejected.)			
	 For 17-7 PH and PH 15-7 Mo Parts Heat Treated to the RH Condition - One or more tensile samples shall be processed with each austenite-conditioning load. It shall be of the same alloy designation as the parts and shall continue with the parts through final aging. 			
	Surface Contamination Testing One or more specimens shall be processed and tested.			
	B) SPECIFIC REQUIREMENTS RELATED TO THE PROCESSING OF: Heat Treatment of			
	Austenitic Corrosion Resistant Steel Parts AMS 2759/4			
118.	Knowledge and understanding that that this specification establishes the heat treatment of PARTS manufactured to the specification above.	7	GEN	AMS2759/4
119.	Knowledge and understanding that this specification is applicable to parts made from the following corrosion-resistant steels: 201, 202, 301, 302, 303, 304, 304L, 305, 309, 310, 314, 316, 316L, 321, 347, and 348. (Including letter designations of the same alloy, unless otherwise indicated. Examples: 302B, 303S, 303Se, 304L, 309S, 310S, 316L, etc.	7	GEN	AMS2759/4
	PYROMETRY			
120.	Knowledge and understanding of the requirements of AMS2759 and AMS 2750 (Pyrometry).	7	GEN	AMS2759/4
121.	Knowledge and understanding equipment must at a minimum conform to the AMS2750 Class 5 requirements +/- 25°F (14°C). Heating Environment / Atmospheres	7	GEN	AMS2759/4
122.	Knowledge and understanding that that atmospheres are controlled such that they do not contaminate parts being treated including vacuum and salt baths.	7	GEN	AMS2759/4
123.	Knowledge and understanding that furnaces used to heat treat other classes of steel using atmospheres that could contaminate austenitic corrosion-resistant steel parts shall have purge cycles run and then shall be tested to ensure that the surfaces of parts are free from nitriding and intergranular oxidation.	7	GEN	AMS2759/4
124.	Knowledge and understanding that parts being heat treated shall be suitably isolated from products of combustion. Materials that could attack or contaminate metal shall not contact parts during heat	7	GEN	AMS2759/4
105	treatment. Composition and maintenance of salt baths shall be such as to prevent contamination of the parts. Salt baths shall be tested in accordance with AMS2759.	_	0.511	
125.	Knowledge and understanding that parts shall be heat treated in either air or protective atmosphere. Acceptable protective atmospheres include argon, helium, hydrogen, neutral salt, and vacuum. Nitrogen and nitrogen-hydrogen blends are permitted as a backfill quench for vacuum furnaces and as a protective atmosphere if a minimum of 0.020 inch (0.51 mm) is to be removed from all surfaces after heat treatment. For scale-free or discoloration-free parts, an air atmosphere and air cooling	7	GEN	AMS2759/4
126.	Should be avoided. Knowledge and understanding that the use of nitrogen manufactured by the dissociation of ammonia is prohibited.	10	GEN	AMS2759/4
	Protective coating			
127.	Knowledge and understanding that the use of protective coatings is permitted only when approved by the cognizant engineering authority. Approval is not required when it can be demonstrated that the coating can effectively prevent intergranular oxidation in excess of 0.0007 inch (0.018 mm). All	7	GEN	AMS2759/4
	protective coatings shall be removed after heat treatment.			

128.	Knowledge and understanding that fixtures and fixture materials shall not cause contamination of parts and shall not reduce heating, or cooling rates to less than that required to prevent carbide precipitation.	7	GEN	AMS2759/4
	Cleaning			
129.	Knowledge and understanding that cleaning is in accordance with AMS2759	7	GEN	AMS2759/4
	SOAKING			
	Solution Heat Treatment			
130.	Knowledge and understanding that heating shall be controlled, as described in AMS2759, such that	7	GEN	AMS2759/4
	either the heating medium or the part temperature, as applicable, is maintained at the required set			
	temperature for the specified soak time. The start of soaking time shall be in accordance with			
	AMS2759.			
131.	Knowledge and understanding that annealing shall be as required in AMS2759/4.	7	GEN	AMS2759/4
131.	Knowledge and understanding that heat treating or slow cooling of unstabilized grades, except 304L	7	GEN	AMS2759/4
132.		1	GEN	AIVI52759/4
	and 316L, between 875 and 1500 °F (468 and 816 °C) is prohibited			
	Straightening			
133.	Knowledge and understanding that straightening shall be accomplished at ambient temperature with	7	GEN	AMS2759/4
	a post-straightening stress relief in accordance with AMS2759/11, cycle 2			
	Properties			
	Surface Contamination			
134.	Knowledge and understanding that Surface Contamination shall be in accordance with AMS2759	7	GEN	AMS2759/4
104.	and as follows.	'	0LIN	/1002/00/4
	When any surface of a part is not machined after heat treatment, the protective			
	atmosphere or backfill medium in furnaces, for heating parts above 1350 °F (732 °C),			
	shall be controlled to prevent nitriding and/or intergranular oxidation.			
	 Parts heat treated in salt baths shall be free of residual salts. 			
	Furnaces used exclusively to heat treat parts which will have all contamination removed			
	shall not require testing .			
	Carbide precipitation			
135.	Knowledge and awareness that other means of cooling than those tabulated in AMS2759/4 are	7	GEN	AMS2759/4
	permitted provided testing substantiates that the cooling rate is rapid enough to prevent carbide			
	precipitation			
	Test Methods			
136.	Knowledge and understanding that testing shall be carried out in accordance with AMS 2759 and as	7	GEN	AMS2759/4
100.	follows.		0	/ 11/02/00/1
	Surface Contamination			
137.	Knowledge and understanding that testing shall be by metallurgical examination at between 400 and	7	GEN	AMS2759/4
137.	600X magnification of etched specimens prepared in accordance with ASTM E3. The chord method	'	GEN	AIVI32739/4
	in ARP1820 may be used to enhance this examination.			
	Carbide Precipitation			
400		7		ANACO750/4
138.	Knowledge and understanding that carbide precipitation shall be determined in accordance with	7	GEN	AMS2759/4
	ASTM A262			
	QUALITY ASSURANCE PROVISIONS			
139.	Knowledge and understanding that the responsibility for inspection, classification of tests, sampling	7	GEN	AMS2759/4
	and testing, approval, records, record retention, and report/certification shall be in accordance with			
	AMS2759 and the following			
	Preproduction Tests			
	Surface contamination is a preproduction test and shall be performed prior to any production heat			
	treating for each piece of equipment and type of atmosphere to be used in each furnace. Carbide			
	precipitation if applicable is a preproduction test and shall be performed prior to any production heat			
	treatment for each piece of equipment and each alternate quenching and cooling method used.			
	Sampling			
	Shall be in accordance with AMS2759 and that for Surface Contamination Testing one or more			
	samples shall be processed.			
	C)) SPECIFIC REQUIREMENTS RELATED TO THE PROCESSING OF Heat Treatment			
	Martensitic Corrosion-Resistant Steel Parts to AMS2759/5			
140.	Knowledge and understanding that this specification establishes the heat treatment of PARTS	7	GEN	AMS2759/5
	manufactured to the specification above.			
141.	Knowledge and understanding that this specification applies to those materials listed. Parts made	7	GEN	AMS2759/5
	from martensitic stainless steels other than those specified may be heat treated in accordance with			
	the applicable requirements using processing temperatures, times, and other parameters			
	recommended by the material producer unless otherwise specified by purchaser			
	Pyrometry			
142.	Knowledge and understanding of the requirements of AMS2759 and AMS 2750.	7	GEN	AMS2759/5
143.	Knowledge and understanding that equipment must conform to the Furnace Class requirements	7	GEN	AMS2759/5
	listed below:			
	a) Annealing subcritical annealing, hardening, straightening, stress relieving and baking			
	shall be a minimum of Class 5 (+/- 25°F (14°C))			
	b) Tempering shall be a minimum of Class 3 $(+/-15^{\circ}F (+/-8^{\circ}C))$			
	Heating Environment / Atmospheres			

144.	Knowledge and understanding that parts must controlled by type and only the class of atmosphere permitted for that type used when heating above 1250°F (677°C).	7	GEN	AMS2759/5
145.	Knowledge and understanding that when treating below 1250°F (677°C) atmosphere types A, B or C may be used.	7	GEN	AMS2759/5
146.	Knowledge and understanding of the requirement to classify parts according to the rules related to machined, partially machined or as supplied condition.	7	GEN	AMS2759/5
147.	Knowledge and understanding that if the part type cannot be determined it shall be processed as Type 2 – Parts with finished surfaces, surfaces with less than 0.020 inch (0.51 mm) to be removed after heat treatment (including hot finished surfaces that will remain on the part), or combinations of these.	7	GEN	AMS2759/5
148.	Knowledge and understanding that atmospheres shall be limited to those permitted.	7	GEN	AMS2759/5
149.	Knowledge and understanding atmosphere furnaces must be equipped and controlled to meet the surface contamination limits of this specification. Salt baths shall be controlled and tested in accordance with AMS2759. Vacuum furnaces shall be controlled and tested in accordance with AMS2769.	7	GEN	AMS2759/5
150.	Knowledge and understanding that cleaning shall be in accordance with AMS2759.	7	GEN	AMS2759/5
100.	Preheating		OLN	AM62133/3
151.	Knowledge and understanding of the preheating recommendations of the specification.	7	GEN	AMS2759/5
	Soaking			
152.	Knowledge and understanding that start of soak shall be in accordance with AMS 2759 and soak time shall be as required in this specification	7	GEN	AMS2759/5
153.	Knowledge and understanding that parts protected by copper plating or coated with reflective coatings which tend to reflect radiant heatshall have their soaking time increased by 50% when processing at setpoints above 1200 °F (649 °C), unless load thermocouples are used.	7	GEN	AMS2759/5
154.	Knowledge and understanding that annealing shall be accomplished by heating to the specified temperature for the required time and cooling to below the specified temperature at the rate shown followed by air cooling or equivalent to ambient temperature. Isothermal annealing treatments may be used providing equivalent hardness and microstructure are obtained.	7	GEN	AMS2759/5
155.	Knowledge and understanding that when Subcritical Annealing is required, it shall be performed prior to hardening by heating in the range 1350 to 1450 °F (732 to 788 °C), except 431 alloy, which shall be at 1150 to 1200 °F (621 to 649 °C) and 440C alloy, which shall be at 1250 to 1350 °F (677 to 732 °C), soaking for the required time, and cooling to ambient temperature.	7	GEN	AMS2759/5
156.	Knowledge and understanding that Hardening (Austenitizing and Quenching) shall be accomplished by heating to the austenitizing temperature shown, soaking for the specified time, and quenching as required. The parts shall be cooled to or below the liquid quenchant temperature or to a temperature low enough to achieve complete transformation before tempering. Quench liquids shall be controlled and tested as specified in AMS2759. Vacuum quench media shall be controlled and tested as specified in AMS2769.	7	GEN	AMS2759/5
157.	Vacuum Furnace Gas Pressure Quenching Knowledge and understanding that for all materials listed in AMS2759/5, forced gas quenching is only permitted for parts where the minimum dimension of the maximum thickness of the part is 1 inch or less. For thickness greater than 1-inch (25.4 mm) qualification is required.	7	GEN	AMS2759/5
158.	Knowledge and understanding that quench gases shall be in accordance with AMS2769. Single gas types or mixtures may be used for gas pressure quenching provided the quenching process is qualified in accordance with the requirements contained in this document.	7	GEN	AMS2759/5
159.	Knowledge and understanding that after quenching and prior to tempering, subzero cooling may be required. It is recommended that subzero cooling begin within 2 hours from end of quench. For subzero treatments, interruptions of the soaking period are permitted. The total soak time shall not include any time when the temperature is warmer than -90 °F (-68 °C) due to interruptions.	7	GEN	AMS2759/5
160.	Knowledge and understanding that Tempering shall accomplished by heating quenched parts to the temperature required to develop the required properties,	7	GEN	AMS2759/5
161.	Knowledge and understanding that suggested temperatures for specific hardness or tensile strengths for specific alloys are given in AMS2759/5.	7	GEN	AMS2759/5
162.	Knowledge and understanding that initial tempering should begin within 2 hours from end of quench or within 2 hours from when subzero cooled parts have reached ambient temperature.	5	GEN	AMS2759/5
163.	Knowledge and understanding that Soaking time shall be not less than 2 hours plus 1 hour additional for each inch (25 mm) of thickness or fraction thereof greater than 1 inch (25 mm). Thickness is defined in AMS2759. When load thermocouples are used, the soaking time shall be not less than 1 hour.	7	GEN	AMS2759/5
164.	Knowledge and understanding that multiple tempering is permitted for all alloys and required for some. When multiple tempering is used, parts shall be cooled to ambient temperature (or below, if specified) between tempering treatments	7	GEN	AMS2759/5
165.	Knowledge and understanding that if parts cannot be tempered within 2 hours from end of quench or within 2 hours from when subzero cooled parts have reached ambient temperature, parts may be snap tempered for a minimum of 2 hours at 300 °F (149 °C). If the tempering temperature is below 325 °F (163 °C) the snap temper shall be no greater than 25 °F (14 °C) degrees below the final tempering temperature.	7	GEN	AMS2759/5
166	Straightening	7		AM00750/5
166.	Knowledge and understanding that when straightening of heat treated parts is required and the procedure is not specified, straightening shall be performed as follows:	7	GEN	AMS2759/5

Incluined lensite strength stated. Frequency of hardness testing shall be in accordance with AMS2759, except partial decarburzation shall not exceed 0.005 inch. These requirements also apply to the cumulative effects of operations such as ausentifizing. For healt treatment, the original specimen, sample part or a portion thereof shall accompany the parts and be tested after reheat treatment. No. 0006 inches (20 micros) thick in accordance with AMS2759, except parts activities (20 micros) thick in accordance with AMS2476 shall not require treatment. 7 GEN AMS2759/5 17.0. Knowledge and understanding that that parts that are completely masked with a copper plate, not less statisting biltstring, peeling or porosity of the plating are required to be tested. 7 GEN AMS2759/5 17.1. Knowledge and understanding that testing shall be carried out in accordance with AMS2759. 7 GEN AMS2759/5 17.2. Knowledge and understanding that hardness is an acceptance tests and shall be performed on each for second reletion and reportCertification shall be in accordance with AMS2759. 7 GEN AMS2759/5 17.2. Knowledge and understanding that hardness is an acceptance tests and shall be performed on each for second reletion and shall be performed on each for accordance with AMS2759/5. 7 GEN AMS2759/5 17.3. Knowledge and understanding that hardness is an acceptance tests and shall be performed on each for accordance with AMS2759/5. 7 GEN AMS2759/5 <th></th> <th></th> <th></th> <th></th> <th></th>					
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	104		7	CEN	AM6 11 6075
	184.		/	GEN	AIVIS H 68/5
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185.	Knowledge and understanding of the need or requirement to carry out purges before treating materials in furnaces whose use is not limited solely to aerospace work.	7	GEN	AMS H 6875
186.	Knowledge and understanding that salt baths may only be used for Class B steels (Martensitic Corrosion Resistant Steels) and must be tested initially and at least weekly to prevent carburization, decarburization, IGA, IGO.	7	GEN	AMS H 6875
407	Temperature Uniformity		0511	ANO 11 0075
187.	Knowledge and understanding of the requirements of AMS 2750 (Pyrometry).	7	GEN	AMS H 6875
188.	Knowledge and understanding that furnaces must have instrumentation to a minimum of Type D.	7	GEN	AMS H 6875
189.	Knowledge and understanding that Furnace Class requirements are per AMS2750 as follows: Aging of (Class D) PH stainless steels at 1025 °F (552 °C) and below - Furnace Class 2 +/-100F (+/- 60C) Aging of (Class D) PH stainless steels above 1025 °F (552 °C) - Furnace Class 3 +/- 150F (+/-80C) and All Other Processes - Furnace Class 5 +/-250F (+/-140C). Quench tanks	7	GEN	AMS H 6875
190.	Knowledge and understanding that Quench tanks must permit total immersion and provide adequate circulation to produce the required properties in the largest material processed.	7	GEN	AMS H 6875
191.	Knowledge and understanding that for Oil Quenching medium must be between 60°F and 160F (15°/71°C) at the beginning of the quench and shall not exceed 200°F (93°C) at any time. The temperature of the oil quenching media shall not exceed the manufacturers recommended operating range. Quench oil used in integral quench vacuum furnace systems, where the quench chamber is below atmospheric pressure, shall be vacuum degassed at approximately the maximum recommended temperature for the quenchant initially and after each major addition of oil.	7	GEN	AMS H 6875
192.	Knowledge and understanding that Aqueous Polymer Quenchants may be used as permitted in AMS H 6875. Baths must have adequate circulation.	7	GEN	AMS H 6875
100	Quenching from Salt Bath Furnaces	-	0.511	4140 11 0075
193.	Knowledge and understanding that water-quenching baths employed in cooling steel parts that have been heated in salt-bath furnaces should be provided with an inflow of fresh water to prevent a concentration of dissolved salts in the tanks. Polymer quenching baths when used in conjunction with salt bath furnaces shall be monitored weekly so that the salt content of the bath shall not exceed 6% by weight of the bath. All salt residues shall be removed from parts processed in salt-bath furnaces or quenched in brine, during or immediately following quenching.	7	GEN	AMS H 6875
	Thermal Treatment			
194.	Knowledge and understanding that heating rates must be controlled to prevent damage to material.	7	GEN	AMS H 6875
195.	Knowledge and understanding that material in Class B shall be hardened by Austenitizing, Quenching and Tempering.	7	GEN	AMS H 6875
196.	Knowledge and understanding that Austenitizing temperature and times shall conform to AMS H 6875.	7	GEN	AMS H 6875
197.	Knowledge and understanding that Quenching shall be carried out in the quenchant specified.	7	GEN	AMS H 6875
198.	Knowledge and understanding that if hardened material cannot be tempered within 2 hours after quenching material may be Snap Tempered at 400°F +/- 25°F (204°C +/- 14°C) for 1 hour or as appropriate to prevent cracking.	10	GEN	AMS H 6875
199.	Knowledge and understanding that Tempering shall be carried out in compliance with AMS H 6875. Tempering temperatures of AMS H 6875 are recommended unless indicated as mandatory.	7	GEN	AMS H 6875
200.	Knowledge and understanding that Class D steel parts shall be hardened by precipitation heat treatment of material which has been either solution heat treated or solution treated and cold worked. Thermal treatment for Type D material shall conform to AMS H 6875. The temperature in AMS H 6875 may be adjusted higher to meet specific tensile strengths.	7	GEN	AMS H 6875
201.	Knowledge and understanding that annealing (full annealing) or sub-critical (partial) annealing of Class B or C material shall be accomplished in accordance with AMS H 6875	7	GEN	
	Stress Relieving			
202.	 Knowledge and understanding that stress relieving after hardening of Classes B material shall be accomplished by heating to a maximum temperature of 50 °F below the tempering temperature. Stress relieving after hardening is prohibited on parts that have been peened or cold deformed; e.g., roll threaded. Knowledge and understanding that stress relieving of Class C material shall be accomplished by either heating to 875 °F ± 25 maximum or to 1900 °F and rapid cooling. Knowledge and understanding that hardened Class D material shall be stress relieved for a minimum of 1 hour at 30 °F below the aging temperature. 	7	GEN	AMS H 6875
	Cleaning			
203.	Knowledge and understanding that material shall be cleaned prior to heat treatment to remove contaminants and leave no substance that could have a deleterious effect. Cleaning prior to heat treatment is not required for Mill products provided no surface condition is retained that could have a deleterious effect on the product.	7	GEN	AMS H 6875
004	Spacing Knowledge and understanding that material shall be racked or supported to allow circulation of	7	GEN	AMS H 6875
204.	be atime and assessable assesses to be ative a survey ship. If the line is the			
204.	heating and quenching media exposure to heating or quenching media and to minimize warpage. Knowledge and understanding that approval from the cognizant engineering organization must be	7	GEN	AMS H 6875

206.	Knowledge and understanding of the specific requirements of AMS H 6875 for the relevant class of material in determining the heat treatment parameters required to achieve the desired mechanical properties.	10	GEN	AMS H 6875
	Surface Contamination			
207.	Knowledge and understanding that when material is hardened, normalized, or re-hardened the requirements for Decarburization, Carburization and Nitriding and inter-granular attack (IGA) shall apply unless it is definitely known that sufficient material will be subsequently removed to eliminate deleterious surface conditions.	7	GEN	AMS H 6875
	Decarburization, Carburization and Nitriding and inter-granular attack (IGA)			
208.	Knowledge and understanding of the need to control decarburization of Class B material. For furnaces required to treat material to >HRC46 (220ksi/1517Mpa) partial decarburization shall be judged excessive if greater than 0.003 inch deep on any finish machined surface. For furnaces used to heat-treat material whose final hardness will be less than HRC 46 (220 ksi) decarburization shall be not greater than 0.005 inch deep on any finish machined surface.	7	GEN	AMS H 6875
209.	Knowledge and understanding that total decarburization is not acceptable.	10	GEN	AMS H 6875
210.	Knowledge and understanding that furnaces used for Heat Treatment above 1250°F(676°C) must be controlled to preclude carburizing or nitriding.	7	GEN	AMS H 6875
211.	Knowledge and awareness that furnaces used for Heat Treatment above 1250°F(676°C) shall be controlled to preclude IGA exceeding 0.0007 inches(0.018mm) on material heat treated to <220 ksi (1517Mpa) and 0.0005 inches (0.013mm) on other materials. Quenchant effectiveness	7	GEN	AMS H 6875
212.	Knowledge and that the consistency of quenchant effectiveness must be determined in each quench tank initially then at least quarterly by one of the methods detailed. Results shall be recorded for ongoing comparison. When results deviate outside of required limits then the test shall be repeated after appropriate corrective action has been taken. Heat Treatment of Parts	7	GEN	AMS H 6875
040		7	OFN	AMO 11 0075
213.	Knowledge and understanding that under this specification PARTS must be treated in accordance with AMS 2759 and that any reference in this specification (AMS H 6875) to PARTS is superseded by the requirements of AMS 2759. Control Records	7	GEN	AMS H 6875
014		5		
214.	Knowledge and understanding that that records of system accuracy tests, furnace temperature surveys, calibration of control and recording instruments and date, time, temperature, and quenchant used in heat treating material shall be on file and available for review by contractors and Government representatives for 5 years. In addition, heat treaters of final parts shall keep furnace recorder charts for 5 years.	5	GEN	AMS H 6875
215		7	CEN	AMS 11 6975
215.	Knowledge and understanding that each furnace used for normalizing and austenitizing of Classes B material and solution treating and austenite conditioning of Class D material shall be tested for conformance with surface contamination requirements. (A furnace used exclusively for heat-treatment of material where all contamination on that material will subsequently be removed need not be tested)	7	GEN	AMS H 6875
216.	Knowledge and understanding that specimens of Classes B material may be tested either in the tempered or in the un-tempered condition at the option of the cognizant engineering organization.	5	GEN	AMS H 6875
217.	Knowledge and understanding that for material made from Classes B and D steels, at least one specimen shall be tested as follows with the first load of each alloy group:	10	GEN	AMS H 6875
	 Each month for atmosphere furnaces, Each week for salt baths, and Each occurrence that purge cycles are run for Class D steel 			
0.40	Mechanical Properties		0	
218.	 Knowledge and understanding of the need for conformance to testing requirements, including: Hardness Test of Heat Treated Material Tensile Tests (when specified) Metallographic Tests 	7	GEN	AMS H 6875
219.	Knowledge and understanding of the requirement for Quench Rate Control using one of the following Comparative Cooling Curve Evaluation Magnetic Quenchometer Hot Wire Test Mechanical Properties Test	7	GEN	AMS H 6875
	GENERAL/QMS REQUIREMENTS AFFECTING ALL PROCESSING/SPECIFICATIONS			
220.	Knowledge and awareness that the responsibility for Inspection lies with the special process provider and includes the verification and control of activities carried out by authorized third party contractors or approved suppliers.	7	GEN	AC7102
221.	Knowledge and understanding that the responsibility for compliance lies with the special process provider.	7	GEN	AC7102
222.	Knowledge and understanding that records of SAT, TUS, Calibration, Initial, Periodic, Acceptance Tests, Test results on product and records of all related process parameters and controls must be maintained and available for inspection for a period specified by regulating bodies or customers whichever is the greatest.	7	GEN	AMS2750
	which even is the greatest.			

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246. Attentive to details 7 GEN	245.			-	
	:46.	Attentive to details	7	GEN	
		EXPERIENCE: Are the minimum experience requirement expected to demonstrate their competence.			

	NOTE: ARP 1962 (Aerospace Recommended Practice -Training and Approval of Heat-			
	Treating Personnel) requires that suppliers have a documented personnel training program			
	including documented training to an established outline and initial and periodic evaluation of			
	the competency. Evaluation to the requirements of this program should be used in			
	completing this section. The following are recommendations and would be superseded by			
	the supplier's specific documented program. The supplier program may define alternative			
	criteria, waivers and equivalences.			
	Recommended Minimum Classroom Training			
247.	Heat Treatment – 80 hours			
	Paperwork – 40 hours	10	GEN	ARP 1962
	Test, Inspection, Maintenance – 40 hours			
	Recommended Minimum On-the-Job-Training			
248.	Furnace atmospheres and atmosphere control –12 months			
		10	GEN	ARP 1962
	Stainless and PH Steels – annealing , stress relief and dimensional stabilization– 12 months	10	GEN	ARF 1902
	All other treatments except those above - 24 months			
	Testing and Evaluation			
249.	Initial and periodic evaluation of personnel is required. The type of frequency of the evaluation shall			
	be determined by the company employing the individual, except that each individual shall be			
	evaluated at least every 5 years. This shall be defined in the formal written program. Evaluation may	10	GEN	ARP 1962
	consist of any combination of written or oral examination or testing, structured checklist review,			
	employee performance appraisal, company employee specific audit program or other appropriate			
	methodology defined in the formal written program.			
	NON-SPECIAL PROCESS RELATED REQUIREMENTS:			
	Defined within these roles are other general or pre-requisite needed			
250.	Must have a thorough understanding of general Quality Systems (AS9100) or equivalent.	7	GEN	AS9100
		'	OLIN	A00100
251.	Must have a thorough understanding of customer specific requirements.	7	GEN	AS9100
050	Must have a thereway we used another diverse of Constant of New Conformance of the environment and used used			
252.	Must have a thorough understanding of Control of Non Conformance for equipment and product	-		400400
	including containment, customer notification and disposition.	7	GEN	AS9100

7. PORTFOLIO REQUIREMENTS

Row #	COMPETENCE	Exam Type Written/ Practical	Reference Guidelines
	PORTFOLIO REQUIREMENTS (for OWNER LEVEL Qualification Only) Portfolio must include the following components for consideration		
253.	Planner Exam Score (Must receive at least 80%)		
254.	Planner Exam Validity (Must be within 6 months of requalification)		
255.	Experience Survey		
256.	Resume of Experience (Description of Current and Previous Jobs)		
257.	Employer / Client Verification (Signed Statement of Corroboration by either current employer or client)		
	NOTE: The above components will be scored accordingly		

8. DOCUMENT REVISION HISTORY

REVISION DATE	SUMMARY
1 May 2018	Updated template
11 October 2018	Reviewed by eQualified Content Developer to ensure it was up to date.
4 December 2019	Editorial revision to update program name from eQualified to PRI Qualification ^{SM.}

ADDENDUM 1

LIST OF INDUSTRY STANDARDS FOR HEAT TREATMENT OF STAINLESS AND PH STEELS

SPECIAL PROCESS	DOCUMENT TITLE	DOCUMENT NUMBER
Heat Treating	Nadcap Audit Criteria for Heat Treatment	AC7102
Heat Treating	Nadcap Audit Criteria for Hardness and Conductivity Testing	AC7102/5
Heat Treating	Nadcap Audit Criteria For Heat Treating Pyrometry	AC7102/8
Heat Treating	SAE Aerospace Materials Specification – Pyrometry	AMS2750
Heat Treating	SAE Aerospace Materials Specification –Heat Treatment of Steel Parts General Requirements	AMS2759
Heat Treating	SAE Aerospace Materials Specification – Heat Treatment of Parts in Vacuum	AMS2769
Heat Treating	SAE Aerospace Materials Specification – Precipitation-Hardening Corrosion-Resistant and Maraging Steel parts	AMS2759/3
Heat Treating	SAE Aerospace Materials Specification – Heat Treatment of Austenitic Corrosion-Resistant Steel Parts	AMS 2759/4
Heat Treating	SAE Aerospace Materials Specification – Heat Treatment Martensitic Corrosion-Resistant Steel Parts	AMS 2759/5
Heat Treating	SAE Aerospace Recommended Practice - Training and Approval of Heat- Treating Personnel	ARP 1962
Quality	AS9100 Quality Management Systems - Requirements for Aviation, Space and Defense Organizations	AS9100
Quality	Quality Standards	ISO9001