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Program Document HTBOK

HTBoK-007/OP-1 REV N/A

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BODY OF KNOWLEDGE:

ROLE DESCRIPTION: STAINLESS AND PRECIPITATION HARDENING STEELS SERVICE
SPECIAL PROCESS: Heat Treatment
SCOPE/METHOD: Performance of Stainless and PH Steel Alloys Requirements
LEVEL: Operator

All eQuaLified examinations are created using the applicable eQuaLified 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 eQuaLified BoKs are created by subject matter experts through an exhaustive job analysis process as detailed in the eQuaLified Program Document 6100: Industry Managed Special Process Bodies of Knowledge. All eQuaLified BoKs are updated periodically according to the requirements of the current eQuaLified PD6100 document to ensure they are consistent with current industry practice.

1. INTRODUCTION

This document has been created by the eQuaLified Heat Treat Body of Knowledge Review Board (HT BoKRB) according to the requirements of eQuaLified Program Document PD6100 Industry Managed Special Process Bodies of Knowledge.

This document consitutes the eQuaLified BoK for Stainless and PH Steels, Operator. 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 eQuaLified examination candidate preparation
- Heat Treat Examination Review Board (HT-ERB) for the development of eQuaLified examinations
- Candidates taking eQuaLified examinations who wish to prepare in advance

2. REFERENCES

eQuaLified documents:

PD6000	Governance & Administration of eQuaLified Program
PD6100	Industry Managed Special Process Bodies 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 eQuaLified 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, Planner and Planner. 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 eQuaLified examination candidates are recommended to read all documents referenced in section 2 of this document.

As stated in eQuaLified PD6200, every eQuaLified 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 eQuaLified approved providers can be found at www.eQuaLified.com)

Records of all qualified personnel shall be maintained and include:

- Date of Qualification
- Results of Written
- Results of Practical (if applicable)
- Results of Experience

5. LEVELS

	Level		
Descriptors	**Operator** *Understand and perform the hands-on operations of the special process for which qualification is sought.*	**Planner** *Manage HT facility that contract/conducts heat treat service. Must have higher understanding of PH SS material, process and testing requirements and be able to oversee and assign qualified persons and equipment to achieve requirements for any given furnace run. Must understand the relationship between pyrometry requirements and processing parameters. REASON: Better describes role for this class of materials and processes.*	**Owner** *On site heat treat and process expert. Manage all persons performing work on PH SS material. Must have ability to select correct processing and testing parameters or oversee those trained and qualified to do so. Must be able to establish correct process parameters, troubleshoot problems that arise, manage corrective actions associated with faulty processing, and fully understand all customer requirements associated with PH SS processing and acceptance testing. Must be able to direct appropriate pyrometric practices to achieve required results. REASON: Better describes role for this class of materials and processes.*
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: 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	Takes into consideration behavioral characteristics such as but not limited to: team working, communication, direction and purpose, innovation and problem solving, mutual trust and respect, confidentiality and trustworthiness.		
Skills	Describes the activities necessary to perform each level of job function to comply with the Body of Knowledge		
Non-Special Process Related Requirements	Health & Safety, Environmental, Quality System Requirements.		

Special Process Bodies of Knowledge Review Boards must complete Table 1 to form the BoK

TABLE 1

The guidelines for table 1 boxes are as noted:
Box 1 – Knowledge – Are knowledge based questions.
Box 2 – Skills – Defined within these rolls describes the range of skills.
Box 3 – Personal Attributes – Are statements that will enable judgment of the person's personal attributes.
Box 4 – Experience – Are the minimum experience requirement expected to demonstrate their competence.
Box 5 – Non-Special Process Related Requirements – Defined within these rolls are other general or pre-requisite needed.

Row #	COMPETENCE **SPECIAL PROCESS: HEAT TREATMENT OF STAINLESS AND PRECIPITATION HARDENING STEELS** **SCOPE / METHOD:** Performance of Heat Treatment processes on Stainless and Precipitation Hardening alloy steels to comply with customer specific / international standard requirements. **CONTROLLING SPECIFICATIONS – AMS 2759/3 :** Precipitation-Hardening Corrosion-Resistant and Maraging Steel parts **AMS 2759/4 :** Heat Treatment of Austenitic Corrosion-Resistant Steel Parts **: AMS2759/5** Heat Treatment Martensitic Corrosion-Resistant Steel Parts **AMS 6875 parts B,C,D for Heat Treatment of Raw Material** **AMS2759** Heat Treatment of steel parts – General Requirements **AMS2769;** Heat Treatment of Parts in Vacuum **REFERENCE GUIDELINES:** This document is written to cover both general and specific BoK requirements which are controlled by the specifications above.	Level (e.g. OP, PL, OW, T1)	Weight (1,3,7,10)	Exam Type Gen/Specific/Practical	Reference Guidelines (See description above)	Checklist Reference
1	**Understands:** **The basic knowledge of the special processes, methods and tools**					
2	**GENERAL QUALITY SYSTEMS KNOWLEDGE:**	OP	7	GEN	AS9100	
4	Awareness and understanding of Aerospace Quality system and compliance in so far as it applies to their day to day work.	OP	7	GEN	AS9100	
5	Full and complete understanding of internal work instructions as well and a working understanding of industry standards as they apply to internal work instructions. (see Addendum -1 of this document)	OP	7	GEN	AS9100	
6	Awareness and understanding of how non-conformance is controlled using tools such as Root Cause Corrective Action and 5 why's.	OP	7	GEN	AS9100	
7	Awareness and understanding of the need to meet safety compliance requirements as applicable.	OP	10	GEN	AS9100	
8	Awareness and understanding of the requirements for traceability of calibration to NIST or equivalent agencies for Pyrometry equipment. (In sourced or Out sourced)	OP	7	GEN	AS9100	
9	**PYROMETRY**					
10	Awareness 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.	OP	7	PRAC	AMS2750/E	
11	Awareness and understanding of the importance of compliance with work instructions to pyrometry and furnace class (uniformity) as required by customer or material specifications.	OP	10	PRAC	AMS2750/E	
12	**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.**					
13	**GENERAL METALLURGICAL KNOWLEDGE RELATED TO HEAT TREATING STAINLESS AND PH STEELS (Applicable to all specifications including AMS 2759 and AMS2769)**	OP	7	GEN		
14	Understanding of the different types of Stainless steels – Austenitic; Martensitic and Precipitation Hardening / Maraging.	OP	7	GEN		
15	**The ability to execute Heat Treatment instructions applied to Stainless and Precipitation Hardening Steels including the following**	OP	7	GEN	AMS2759/3	
16	• Annealing • Stress relieving • Stabilization(Dimensional)	OP	7	GEN	AMS2759, AMS2769 & AMS2759/3	

	• 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					
17	**Awareness and understanding of the definitions and importance of terms applicable to Heat Treatment of Stainless and PH Steels**	OP	**10**	GEN	AMS 2759 & AMS 2769	
18	• Set temperature (Set Point) • Recovery time • Heating • Start of soak • Soak time • End of soak • Interruptions • Quench delay • Temper / Cryogenic delay • Protective Coatings • Cleaning • Homogenization (effects on Heat treatment response)	OP	7	GEN	AMS 2759 & AMS 2769	
19	Awareness and understanding of the use and application of protective compounds to minimize possible contamination from furnace atmospheres. Coatings must be applied according to Customer / Prime requirements.	OP	7	GEN	AMS275/3 3.3.2 AMS2759/4 3.3.2 AMS 2759/5 3.3.4	
20	Awareness and understanding that Heat Treating equipment and instruments for the Heat Treatment of Stainless and PH Steels must be in accordance with AMS2750 all the customers' requirements.	OP	7	GEN	AMS2759 3.1 AMS2769 3.1	
21	Awareness and understanding that heat treating facilities must possess the correct temperature uniformity, instrument accuracy and resolution for the heat treating of Stainless and PH Steels in accordance with all the customers' requirements.	OP	7	GEN	AMS2759/3/4 /5 3.2	
22	**Furnace Atmospheres (including Vacuum)**					
23	Awareness and understanding that' in furnace' atmospheres must be controlled so that the parts/raw material in process does not get contaminate by the atmosphere or by the residual atmosphere from a previous load.	OP	7	GEN	AMS2759/3 3.3.1 AMS 2759/4 3.3.1 AMS 2759/5 3.3	
24	Awareness and understanding that furnaces may be required to be purged with inert gas before they can be used for treating Stainless or PH Steels. This is the case when the atmosphere used previously was Endo thermic or Exothermic gas or any other Nitrogen/hydrocarbon /Hydrogen blend - this is particularly important in Batch type furnaces including Integral (Sealed) Quench and Retort type furnaces.	OP	7	GEN	AMS 2759 3.3.5 AMS2759/3 3.3.1 AMS 2759/4 3.3.1 AMS 2759/5 3.3	
25	Awareness and understanding that 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.	OP	7	GEN	AMS2759 3.3.8	AC7102/H 9.6.2
26	Awareness and understanding that salt residues must be removed immediately after quenching and before any following process.	OP	7	GEN	AMS2759 3.3.8	
27	**Loading Check** Understanding of the need to verify internal condition of the furnace prior to loading to check cleanliness and freedom from mechanical damage (may be a visual only check).	OP	7	GEN		
28	**Heat Treatment in Vacuum Furnaces**					
29	Awareness and understanding that Vacuum furnaces used must meet the, requirements of AMS 2769 and Customer / Prime specifications and be capable of achieving the Vacuum levels specified and also leak rates.	OP	7	GEN	AMS2769 3.1 / 3.1.1.3	
30	Awareness and understanding that periodic contamination checks must be carried out on representative test coupons	OP	7	GEN	AMS2769 3.1.1.4	
31	Awareness and understanding that door and other seals (e.g. Thermocouple entry bungs) must be clean and free from damage or tears . Also understanding of the requirements for cleaning and greasing different types of sealing material as defined on the traveler / data card or in specific internal instructions.	OP	7	GEN		
32	Awareness and understanding of the need for documenting repairs or changes of seals particularly on doors, thermocouple entry ports and gauges.	OP	7	GEN		
33	**Cleaning**	OP	7	GEN		
34	Awareness and understanding that prior to heat treating or annealing, parts shall be clean and visually free of contaminants such as dirt, metal residues, lubricants and solvent	OP	7	GEN	AMS2759 3.3.2 AMS2769	AC 7102/H 5.2.1

	residues. Awareness and understanding of the need for cleaning parts the application of methods applicable. Particularly important in relation to Vacuum Heat Treatment and treatment of parts with less than 0.020 inch or 0.50mm machining after treatment.				3.3.4	
35	Understanding of why all machined PH parts must be handled wearing gloves throughout processing.	OP	7	GEN		AC7102/S 5.3.1
36	**Racking, Fixturing and Spacing**					
37	Awareness and understanding that specially designed racks and fixtures must be used for the specific parts they are designed for.	OP	7	GEN	AMS2759 3.3.4	AC7102/S 5.3.1
38	Awareness and understanding that racks, fixtures and/or baskets must be free from residues from salt baths and other contamination.	OP	7	GEN	AMS 2759 3.2.5/3.2.6	
39	Knowledge and understanding that parts must be spaced far enough apart to ensure uniform heating and cooling and not impede circulation of the heating medium and quenchant.	OP	7	GEN	AMS2759 3.3.4	AC7102/S 5.3.1
40	**Soak**					
41	Knowledge and understanding that parts shall not be loaded into a furnace who's temperature with a temperature higher than the set temperature unless load sensors are used to check that temperature tolerance is not exceeded.	OP	7	GEN	AMS2759 3.3.6	
42	Understanding of why adherence to set temperatures and furnace uniformity is critical especially for solution treatment Set temperature shall be based on Work instructions unless a permissible Offset is applied. Offsets must meet AMS2750 and be documented.	OP	7	GEN	AMS2750 AMS2759 3.3.7	
43	Knowledge and understanding of the differences in the way start of soak is measured either by the furnace control sensor (thermocouple) or a load (thermocouple). This is when the control sensor is within +/- 5F (+/- 3C) of set temperature and all other sensors are in tolerance. For Load sensors it is when the last load sensor reaches the lower tolerance on set temperature.	OP	10	GEN	AMS2759/3 3.4.2.1	
44	Understanding of the importance of compliance with minimum and maximum treatment times, including how start and end of soak are defined and whether they are based on furnace (controller) readings or actual metal temperature (load thermocouples).	OP	7	GEN	AMS2759/3 3.4.2 AMS2759/4 3.4.2 AMS2759/D 3.4.3	
45	End of soak is reached when parts are removed from the furnace or when parts cool to the minimum temperature of the uniformity range.	OP	7	GEN	AMS2759 3.4.2.2.	
46	**Quench**					
47	Awareness and understanding that quench mechanisms (Manual or Automated) must be capable of meeting the maximum quench delay required by Customer /Prime specifications and results recorded and verified for each individual load.	OP	7	GEN		AC7102/H 9.9.1
48	Awareness 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.	OP	7	GEN		AC7102H 9.9.1
49	**Quenchant Control**					
50	Awareness and understanding that the temperature of quench media must be controlled and documented in accordance with Customer / Prime requirements.	OP	7	GEN	AMS2759 3.2	AC7102/H 9.10.1
51	Awareness and understanding that records must demonstrate that quench media has been at the specified temperature before, during and after the parts were quenched.	OP	7	GEN	AMS2759 3.2.3	AC7102 9.10
52	Awareness and understanding that agitation of quench media or the parts during quenching must conform to applicable specifications.	OP	7	GEN	AMS2759 3.2.	AC7102 9.10
53	Awareness and understanding that where parts are affected by high residual stress or cracking there must be a system in place to measure and compare quenchant effectiveness.	OP	7	GEN	AMS2759 3.2	
54	**Gas Quenching in Vacuum furnaces**					
55	Knowledge and understanding of importance of working to traveler/data cards. Requirements for selection of quench gas type (e.g. Nitrogen/Argon/Helium) gas pressure during quench, and cooling direction.	OP	7	GEN		
56	Understanding of how to check cooling rates on gas quenching when there are customer specific requirement.	OP	7	GEN		
57	**Low Temperature Treatment when Required by Specification**					
58	Awareness and understanding of procedures addressing cooling requirements after quench.	OP	7	GEN		
59	Awareness and understanding that records must show that cooling after quench is in compliance with customer requirements specified in procedures or shop planning.	OP	7	GEN		
60	Awareness and understanding of the importance of recording the temperature in each refrigeration cycle to allow verification against customer/prime requirements.	OP	7	GEN		
61	**PERIODIC TESTING**	OP	1	GEN		
62	Awareness and understanding of the need for Periodic Testing periodic testing.	OP	1	GEN	AMS2759 4.2.2 AMS2769 4.2.2	
63	Awareness and understanding that periodic testing must be performed per procedures and the customers' requirements and in accordance with AMS2759 and AMS2769.	OP	1	GEN	AMS2759 4.2.2 AMS2769 4.2.2	

67	Understanding of requirements for post quench temper / snap tempering in accordance with material / customer specifications and how these will be applied through local procedures.	OP	7	GEN	AMS2759/5 3.4.7.1 /3.4.9	
70	Understanding of limitations on atmosphere control and surface contamination on parts with no post treatment machining.	OP	7	GEN	AMS2759/3 3.5.3	
1	**SKILLS:** **The skills required to perform a particular special process task**					
2	Within these Rows enter text that describes the range of skills specified in the Body of Knowledge.	OP	7	GEN	General Industry	
3	Has knowledge and understanding to be able to recognize and report in real time deviations from process parameters or other events which may have a negative impact on product quality.	OP	7	GEN	General Industry	
4	Read and understand written instructions.	OP	7	GEN	General Industry	
5	Ability to understand specification requirements and customer flow-down requirements.	OP	7	GEN	General Industry	
6	Recognition of the importance of following work instructions.	OP	7	GEN	General Industry	
7	Understands the safety concerns involved with heat treatment including the proper use of handling tools and personal protective equipment.	OP	7	GEN	General Industry	
8	Understands precautions to be taken when handling thermocouples to avoid damage.	OP	7	GEN	General Industry	
9	Capable of generating and maintaining accurate and complete records required to demonstrate compliance with customer requirements including: •Set temperature •Soak Time •Quench delay time •Quench concentration •Quench temperature before and after quench •Cooling after quench including refrigeration temperature •Periodic and lot acceptance test requirements and results	OP	7	GEN	General Industry	
10	If properly delegated, ability to review and approve heat treatment processing records.	OP	7	GEN	General Industry	
11	Has knowledge and understanding of the proper operation, maintenance and calibration requirements for equipment used for testing, evaluation and acceptance. (e.g., hardness, conductivity)	OP	7	GEN	General Industry	
12	Awareness and understanding of the Preventive Maintenance Program.	OP	7	GEN	General Industry	
1	**Sequencing**					
2	Has an appropriate understanding of where this process falls in the sequence of events and why it should not deviate without customer/end user permission.	OP	10	GEN		
1	**PERSONAL ATTRIBUTES:** ***Are statements that will enable judgment of the person's personal attributes***					
2	Define within the following rows statements from the Body of Knowledge or statements from Company sources that will enable judgment of the person's personal attributes.					
3	Willingness to train and mentor co-workers.	OP	7	GEN		
4	Good communicator at all levels.	OP	7	GEN		
5	Takes responsibility to challenge work instructions that do not appear to conform to specification or customer requirements.	OP	10	GEN		
6	Personal integrity	OP	7	GEN		
7	Attentive to details	OP	7	GEN		
1	**EXPERIENCE:** ***Are the minimum experience requirement expected to demonstrate their competence.***					
2	**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.					
3	**Recommended Minimum Classroom Training**					
4	Heat Treatment – 80 hours Paperwork – 40 hours Test, Inspection, Maintenance – 40 hours	OP	10	GEN	ARP 1962 Table 1	
5	**Recommended Minimum On-the-Job-Training**					
6	Furnace atmospheres and atmosphere control –12 months Stainless and PH Steels – annealing , stress relief and dimensional stabilization– 12 months All other treatments except those above - 24 months	OP	10	GEN	ARP 1962 Table 2	
7	**Testing and Evaluation**					
8	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	OP	10	GEN	ARP 1962 3.3.1.4,	

	individual shall be evaluated at least every 5 years. This shall be defined in the formal written program. Evaluation may 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.				3.3.1.4.1, 3.3.1.4.2	
1	**NON-SPECIAL PROCESS RELATED REQUIREMENTS: Defined within these rolls are other general or pre-requisite needed**					
2	Must have a thorough understanding of general Quality Systems (AS9100) or equivalent.	OP	7	GEN	General Industry	
3	Must have a thorough understanding of customer specific requirements.	OP	7	GEN	General Industry	
4	Must have a thorough understanding of Control of Non Conformance for equipment and product including containment, customer notification and disposition.	OP	7	GEN	General Industry	

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	**Nadccap 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**	**AMS2759/4**
Heat Treating	**SAE Aerospace Materials Specification – Heat Treatment Martensitic Corrosion-Resistant Steel Parts**	**AMS2759/5**
Heat Treating	**SAE Aerospace Recommended Practice - Training and Approval of Heat-Treating Personnel**	**ARP1962**
Quality	**AS9100 Quality Management Systems - Requirements for Aviation, Space and Defense Organizations**	**AS9100**
Quality	**Quality Standards**	**ISO9001**