



Program Document CPBOK

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PD 6103

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BODY OF KNOWLEDGE

ROLE DESCRIPTION: ANODIZING OPERATOR

SPECIAL PROCESS: Chemical Processing

SCOPE: Anodizing

METHOD: Chromic Acid Anodizing, Sulphuric Acid Anodizing, Hardcoat/Hard Anodizing, Phosphoric Acid Anodizing, Anodizing for Bonding, Titanium Anodizing, Magnesium Anodizing, Boric Sulphuric Acid Anodizing, Tartaric Sulphuric Acid Anodizing, Two Step Electrolytic and/or Intrical Area for Aesthetic

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 Chemical Processing Body of Knowledge Review Board (CPBoKRB) according to the requirements of eQualified Program Document PD6100 Industry Managed Special Process Bodies of Knowledge.

This document constitutes the eQualified BoK for Chemical Processing Anodizing including Chromic Acid Anodizing, Sulphuric Acid Anodizing, Hardcoat/Hard Anodizing, Phosphoric Acid Anodizing, Anodizing for Bonding, Titanium Anodizing, Magnesium Anodizing, Boric Sulphuric Acid Anodizing, Tartaric Sulphuric Anodizing for the Operator Level. It defines the baseline knowledge and experience required to be considered competent to perform this role.

Unless otherwise stated, the CP 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

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PRleQuaLified BoK: CP; Chromic Acid Anodizing, Sulphuric Acid Anodize, Hardcoat/Hard Anodizing, Anodizing for Bonding, Titanium Anodize, Magnesium Anodize, Boric Acid Anodizing, Tartaric Sulphuric; Operator

- Chemical Processing Examination Review Board (CP-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	International Aerospace Quality Group

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.

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 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.

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.

SKILL: Ability to perform a particular task. Skill is 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.

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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)

5. LEVELS

	Level		
Descriptors	Operator (OP) <i>Understand and perform the hands-on operations of the special process for which qualification is sought.</i>	Planner (PL) <i>Capable of selecting manufacturing processes and interpreting process procedures to conform to customer specification and requirements.</i> <i>Capable of problem solving and resolving day to day issues.</i>	Owner (OW) <i>Capable of writing, reviewing and approving processes, procedures and qualifications of Operators and Planners. Capable of designing new processes and resolving issues among other levels.</i>
Anodize Process Specific Criteria	No additional criteria for the Anodize process.	No additional criteria for the Anodizing process	No additional criteria for the Anodizing process
Technical Knowledge	Basic knowledge of the Anodizing process, its main processes, methods and tools.	Good level of knowledge in all aspects of the Anodizing 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 Anodizing 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 Anodizing Body of Knowledge		
Non-Special Process Related Requirements	Health & Safety, Environmental, Quality System Requirements.		

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

TABLE 1

ROLE DESCRIPTION: Anodizing Operator

SPECIAL PROCESS: Chemical Processing

SCOPE / METHOD: Chromic Acid Anodizing, Sulphuric Acid Anodizing, Hardcoat/Hard Anodizing, Phosphoric Acid Anodizing, Anodizing for Bonding, Titanium Anodizing, Magnesium Anodizing, Boric Sulphuric Acid Anodizing, Tartaric Sulphuric Anodizing, Two Step Electrolytic and/or Intrical Area for Aesthetic.

REFERENCE GUIDELINES: Addendum 1 is a list of the International Standards applicable to Anodizing processes.

Row #	COMPETENCE	Level (e.g. OP, PL, OW, T1)	Weight (1,3,7,10)	Exam Type Gen/Specific /Practical	Reference Guidelines
1.	KNOWLEDGE: The basic knowledge of the special processes, methods and tools				
2.	GENERAL KNOWLEDGE:				
3.	Understand how to determine if there has been damage to the part surface. Ability to recognize common anodizing problems such as burning, poor contact, etc.	OP	10	GEN	AC 7108: 4.4
4.	Full and complete understanding of Internal Work instructions	OP	10	GEN	AC 7108: 3.3.2
5.	Understand Industry Standards (see Addendum 1 of this document)	OP	7	GEN	Addendum 1
6.	Knowledge and understanding of the Accept/Reject Criteria	OP	7	GEN	AC 7108: 4.4
7.	Knowledge of the Surface Preparation procedures	OP	10	GEN	General Industry
8.	Basic understanding of the control and calibration requirements for equipment.	OP	7	GEN	General Industry
9.	Know how to perform the Water Break Free Cleanliness Verification	OP	10	GEN	AC 7108: 5.8.3
10.	Knowledge and understanding of mathematics, including decimal and fractions	OP	3	GEN	General Industry
11.	Know how to use precision measuring instruments and equipment	OP	7	GEN	General Industry
12.	Know and understand Job Documentation including Fixed and Frozen Process requirements.	OP	7	GEN	General Industry
13.	Know and understand General Cleaning, Mechanical Cleaning and Chemical Cleaning prior to Anodizing.	OP	10	GEN	MIL-A-8625: AC 7108: 3.8, 5.6 – 5.8
14.	Know and understand Sealing performance and process requirements.	OP	10	GEN	AC 7108:3.8
15.	Know and understand how to correct or adjust the Ramp Rate, Voltage and ASF for the Anodizing process.	OP	3	GEN	General Industry
16.	Understand the need for pre-process checks (such as calibration status and solution temperatures).	OP	10	GEN	AC 7108: 3.10
17.	Understand the mechanics and importance of Racking, Part Set-Up and Masking.	OP	10	GEN	AC 7108: 5.9
18.	Thoroughly understand the Anodizing process.	OP	10	GEN	General Industry
19.	Know how to recognize unsafe and/or inappropriate work practices.	OP	7	GEN	General Industry
20.	Know and understand the effects and aspects of the Anodizing process on different alloys and materials (including chemicals, masking materials, tanks, work environment, etc.)	OP	3	GEN	General Industry
21.	Understand how to deal with incorrect or inappropriate Anodizing.	OP	3	GEN	General Industry
22.	Knowledge and understanding about the selection of appropriate equipment for use in the Anodizing process.	OP	3	GEN	General Industry
23.	Understanding of the significance of pH and grades of water purity and their measurement.	OP	7	GEN	General Industry
24.	General knowledge and understanding of all the Anodizing processes.	OP	3	GEN	General Industry
25.	CHROMIC ACID ANODIZING				
26.	Understand "Accept & Reject" Criteria including thickness and color range.	OP	7	GEN	General Industry
27.	Know uses, features and applications for this type of Anodizing.	OP	3	GEN	General Industry
28.	Understand the limitations for this type of Anodizing.	OP	3	GEN	General Industry
29.	Understand the dyeing and sealing options and requirements.	OP	7	GEN	General Industry
30.	Understand the environmental, worker safety and health concerns associated with this	OP	3	GEN	General Industry

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	type of Anodizing.				
31.	SULPHURIC ACID ANODIZING				
32.	Understand "Accept & Reject" Criteria including thickness and color range.	OP	7	GEN	General Industry
33.	Know uses, features and applications for this type of Anodizing.	OP	3	GEN	General Industry
34.	Understand the limitations for this type of Anodizing.	OP	3	GEN	General Industry
35.	Understand the dyeing and sealing options and requirements for this type of Anodizing.	OP	7	GEN	General Industry
36.	Understand the environmental, worker safety and health concerns associated with this type of Anodizing.	OP	3	GEN	General Industry
37.	Knowledge of "Thin-film Sulfuric Acid Anodizing" and similar options.	OP	3	GEN	General Industry
38.	HARDCOAT OR HARD ANODIZING				
39.	Understand "Accept & Reject" Criteria including thickness.	OP	7	GEN	General Industry
40.	Know uses, features and applications for this type of Anodizing.	OP	3	GEN	General Industry
41.	Understand the limitations for this type of Anodizing.	OP	3	GEN	General Industry
42.	Understand the dyeing and sealing options and requirements for this type of Anodizing.	OP	7	GEN	General Industry
43.	Understand the environmental, worker safety and health concerns associated with this type of Anodizing.	OP	3	GEN	General Industry
44.	PHOSPHORIC ACID ANODIZING				
45.	Understand "Accept & Reject" Criteria.	OP	7	GEN	General Industry
46.	Know uses, features and applications for this type of Anodizing.	OP	3	GEN	General Industry
47.	Understand the limitations for this type of Anodizing.	OP	3	GEN	General Industry
48.	Understand the dyeing and sealing options and requirements for this type of Anodizing.	OP	7	GEN	General Industry
49.	Understand the environmental, worker safety and health concerns associated with this type of Anodizing.	OP	3	GEN	General Industry
50.	ANODIZING FOR BONDING				
51.	Understand "Accept & Reject" Criteria	OP	7	SPE	General Industry
52.	Know uses, features and applications for this type of Anodizing.	OP	3	SPE	General Industry
53.	Understand the limitations for this type of Anodizing.	OP	3	SPE	General Industry
54.	Understand the environmental, worker safety and health concerns associated with this type of Anodizing.	OP	3	SPE	General Industry
55.	What type of base materials are used for this type of Anodizing?	OP	3	SPE	General Industry
56.	Type of surface preparations used for Anodizing bonding.	OP	3	SPE	General Industry
57.	TITANIUM ANODIZING				
58.	Understand "Accept & Reject" Criteria.	OP	7	SPE	General Industry
59.	Know uses, features and applications for this type of Anodizing.	OP	3	SPE	General Industry
60.	Understand the limitations for this type of Anodizing.	OP	3	SPE	General Industry
61.	Understand the differences between achieving color on Titanium and other metals, such as aluminum.	OP	7	SPE	General Industry
62.	Know cleaning restrictions when using Titanium.	OP	7	SPE	General Industry
63.	Understand the environmental, worker safety and health concerns associated with this type of Anodizing.	OP	3	SPE	General Industry
64.	MAGNESIUM ANODIZING				
65.	Understand "Accept & Reject" Criteria.	OP	7	SPE	General Industry
66.	Know uses, features and applications for this type of Anodizing.	OP	3	SPE	General Industry
67.	Understand the limitations for this type of Anodizing.	OP	3	SPE	General Industry
68.	Understand the dyeing and sealing options and requirements.	OP	7	SPE	General Industry
69.	Understand the environmental, worker safety and health concerns associated with this type of Anodizing.	OP	3	SPE	General Industry
70.	BORIC SULPHURIC ACID ANODIZING (BSAA)				
71.	Understand "Accept & Reject" Criteria.	OP	7	GEN	General Industry
72.	Know uses, features and applications for this type of Anodizing.	OP	3	GEN	General Industry
73.	Understand the limitations for this type of Anodizing.	OP	3	GEN	General Industry
74.	Understand the dyeing and sealing options and requirements.	OP	7	GEN	General Industry
75.	Understand the environmental, worker safety and health concerns associated with this type of Anodizing.	OP	3	GEN	General Industry
76.	TARTARIC SULPHURIC ACID ANODIZING				
77.	Understand "Accept & Reject" Criteria.	OP	7	SPE	General Industry
78.	Know uses, features and applications for this type of Anodizing.	OP	3	SPE	General Industry
79.	Understand the limitations for this type of Anodizing.	OP	3	SPE	General Industry
80.	Understand the environmental, worker safety and health concerns associated with this type of Anodizing.	OP	3	SPE	General Industry
	SKILLS:				
	Defined within these rolls describes the range of skills. The skills required to perform a particular special process task				
81.	READ AND UNDERSTAND WRITTEN INSTRUCTIONS:	OP	10	GEN	General Industry

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82.	Apply Anodizing techniques appropriately	OP	10	GEN	General Industry
83.	Verify and validate the Anodizing results.	OP	3	GEN	General Industry
84.	Properly report non-conformances	OP	10	GEN	General Industry
85.	Use of appropriate equipment for the Anodizing process.	OP	3	GEN	General Industry
86.	Ability to follow instructions	OP	10	GEN	General Industry
87.	Interpretation of an acceptable Anodizing process	OP		GEN	General Industry
88.	Must be able to set-up operations (select appropriate equipment, determine or enter rates, set timers & read and record temperatures) including alternate procedures as appropriate	OP	3	GEN	General Industry
89.	Must be able to understand and interpret shop travelers	OP	7	GEN	General Industry
	PERSONAL ATTRIBUTES: Are statements that will enable judgment of the person's personal attributes				
90.	Be able to work independently with a minimum of supervision	OP	3	GEN	General Industry
91.	Must have a high degree of integrity	OP	10	GEN	General Industry
92.	Be attentive to details	OP	10	GEN	General Industry
93.	Be flexible	OP	3	GEN	General Industry
94.	Tolerate stress	OP	7	GEN	General Industry
95.	Exhibit conflict resolution	OP	3	GEN	General Industry
96.	Decision making ability	OP	3	GEN	General Industry
97.	Team Worker	OP	10	GEN	General Industry
98.	Ethical Behavior	OP	10	GEN	General Industry
	EXPERIENCE: Are the minimum experience requirement expected to demonstrate their competence.				
	EDUCATION:				
99.	High School Diploma, GED or Secondary Education	OP	7	GEN	General Industry
100.	Apprenticeship	OP	3	GEN	General Industry
101.	Industry Training or Courses	OP	3	GEN	General Industry
	TRAINING / HANDS-ON-EXPERIENCE:				
	Complete on the job training: Minimum number of hours-				
102.	OPERATOR – 160 Hours	OP	10	GEN	General Industry
103.	PLANNER -				
104.	OWNER -				
	NON-SPECIAL PROCESS RELATED REQUIREMENTS: Defined within these rolls are other general or pre-requisite needed				
105.	Capability to lift up to 50 lbs. (23 kg)	OP	7	GEN	General Industry
106.	Able to deal with repetitive bending and stooping	OP	10	GEN	General Industry
	SAFETY & ENVIRONMENTAL REQUIREMENTS:				
107.	Knowledge and understanding of safety and handling of hazardous material, chemicals, etc. including safe storage, interpretation of Health & Safety Data Sheets and Regulatory Requirements	OP	10	GEN	General Industry
108.	Understand Safety Data Sheets (SDS) and Personal Protective Equipment (PPE) Requirements: When and how to use appropriate personal protective equipment (goggles, gloves, rubber boots, aprons, etc.)	OP	10	GEN	General Industry
109.	Understand which personal protective equipment to use, when and why.	OP	10	GEN	General Industry
110.	Understand the safe storage, shelf life and mixing of chemicals.	OP	10	GEN	General Industry
111.	Ability to recognize symbols associated with chemicals and their usage.	OP	10	GEN	General Industry

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ADDENDUM 1

LIST OF INTERNATIONAL STANDARDS FOR (SPECIAL PROCESS)

SPECIAL PROCESS	DOCUMENT TITLE	DOCUMENT NUMBER
Chemical Process	Anodic Coatings for Aluminum and Aluminum Alloys	MIL-A-8625
Chemical Process	Hard Anodic Coating Treatment of Aluminum Alloys	AMS 2468
Chemical Process	Hard Anodic Coating on Aluminum and Aluminum Alloys	AMS 2469
Chemical Process	Anodic Treatment of Aluminum Alloys, Chromic Acid Process	AMS 2470
Chemical Process	Anodic Treatment of Aluminum Alloys Sulfuric Acid Process, Undyed Coating	AMS 2471
Chemical Process	Anodic Treatment of Aluminum Alloys, Sulfuric Acid Process, Dyed	AMS 2472
Chemical Process	Audit Criteria for Chemical Processing	AC7108