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AUDIT CRITERIA

AC7108 REV. J$^{\Delta 1}$

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Superseding AC7108 Rev I

Nadcap
AUDIT CRITERIA FOR
CHEMICAL PROCESSING

TO BE USED ON AUDITS STARTING ON OR AFTER 12-JUN-2022

1. QUALITY SYSTEM APPROVAL AND OTHER GENERAL REQUIREMENTS

1.1 Companies seeking accreditation for processing to AC7108 and its related slash sheets (AC7108/x) must be accredited to an acceptable quality system by an acceptable registration body - see Nadcap Program Document PD 1100.

1.2 Companies carrying out analysis and testing in support of processes to AC7108 must be accredited to AC7108/4 for the scope of analysis and testing performed. Should a processor use a sub-tier provider for some or all of the analysis and testing in support of their AC7108 accreditation that sub-tier provider must be:

Nadcap accredited for AC 7101 (MTL), or

Accredited by a registration body recognized by MTL, or

Accredited by CP to AC7108/4 for the scope of analysis and testing performed, or

Approved by Prime customer(s) for laboratory analysis (see AC7108 Para 3.8.2)

Manufacturers that provide solution analysis and process control testing for their proprietary solutions may be exempt from this requirement provided the following criteria are met: they are the original manufacturer [not a distributor]; testing is provided as a service with the supply of the solution; they have an in-house laboratory and evidence that a quality management system accreditation (Example: AS/EN/JIS Q 9100, ISO 9001) is held.

1.3 An Auditee can retain listing a process/specification in their scope so long as:

- They have an internal procedure for that process that lists the specification and is compliant to its requirements.
- The Auditee has previously processed parts, within the last 5 years, to the processing requirements and has evidence that acceptance test requirements were met.
- The Auditee has previously processed test pieces, within the last 5 years, to the processing requirements and has evidence that the periodic testing requirements have been met.

These items are not required to be part of the audit but shall be made available to the Auditor if requested. If the Auditee cannot provide evidence for any of the above, the Auditor will document the scope items removed and the reason why in the Auditor Notes of the Audit Details Page.

2. INSTRUCTIONS TO AUDITEE

2.1 The Chemical Processing Task Group maintains an Audit Handbook that provides examples on how to comply with various Audit Criteria and also provides the Task Group's interpretation of specification requirements. The Audit Handbook can be viewed/downloaded from www.eAuditNet.com > Resources > Documents > Audit Criteria > Chemical Processing > Handbook and Guides.

2.2 Questions in AC7108 and its slash sheets may include Guidance. This guidance may identify when the question can be answered NA, identify limitations to the scope of the question or provide examples of items that come under the scope of the question. The Guidance cannot contain requirements that are additional to the question.

2.3 **Prior to the Audit**

2.3.1 A self-audit to AC7000, AC7108 and applicable slash sheets must be completed and uploaded to eAuditNet at least 30 days prior to the start of the Nadcap audit, see AC7000.

A self-audit is not required for VCA audits.

2.3.2 Retain a copy of the self-audit on site for review by the Nadcap auditor when requested.

2.3.3 The documents listed in paragraphs 2.3.3.1 through 2.3.3.3 must be uploaded to eAuditNet, in English unless another language is acceptable to the auditor, at least 30 days prior to the scheduled audit:

NOTE: No ITAR/EAR restricted materials are to be submitted.

2.3.3.1 The completed self-audit, see 2.3.1.

2.3.3.2 Specification List. A list of the processing specifications, paint material specifications, and dry film lubricant material specifications covered by the scope of the Nadcap audit. The list shall include the specification number and title or process description (e.g. anodize, silver plate). The Auditee shall not itemize its process capabilities under a general specification e.g. For MIL-A-8625, if the Auditee only does Type I it shall not define this in the spec list, the specification description shall be the spec title or “Anodize”.

2.3.3.3 A drawing/sketch defining the location of each process line for which Nadcap Accreditation is sought.

2.3.4 List of items that need to be presented to the auditor on arrival:

2.3.4.1 Approved Supplier List

2.3.4.2 Schedule of calibrations, TUS, SAT, solution analysis etc.

2.3.4.3 List of quality personnel by process

2.3.4.4 List of trained personnel by process

2.4 **During the Audit**

2.4.1 Refer to AC7000.

2.4.2 Per the Chemical Process Audit Handbook and Chemical Process Audit Review Guidelines, Chemical Process Auditors may raise “OBSERVATIONS”

2.5 **Following The Audit**

2.5.1 Refer to AC7000.

2.6 **Definition of Terms (See ISO2080 for general terms and definitions associated with chemical processing)**

AMBIENT TEMPERATURE FOR PROCESS TANKS: Unless otherwise specified by customer, specification or process control document, ambient is the natural uncontrolled temperature at the location of the tank and need not be monitored or controlled.

AUTOMATIC PROCESS LINE: A fully automatic process line is one in which all the variables of a chemical process sequence are maintained, controlled and recorded by an automated, e.g. computer, system. Variables include (but are not limited to) solution immersion times, solution temperatures, step sequencing, and current/voltage settings. An automated process line does not require operator intervention to validate or monitor any part of the processing operation. The operator may be required to initiate, sequence or queue the specified, pre-established and programmed handling equipment or process, but does

not alter or adjust the process variables, with the exception of halting a sequence that is in failure mode (in response to an alarm, warning, etc.)

Where the process cycle, or part of, is controlled by an automatic controller, e.g. operator selects program#, a record of the achieved process cycle (actual voltage/amperage vs time) is still required to be recorded and traceable to the load. Alternatively, the program# may be revision controlled, and what the program actually achieves verified periodically and at each change. Records of all the verifications shall be maintained. Where the periodic verification identifies a failure to meet defined requirements, e.g. due to partial electronic failure, concession procedure for all hardware processed since the last acceptable verification is required.

BATCH: A quantity of parts of the same part number that are processed on the same route card/traveler.

BUY-OFF: A recorded declaration by a qualified/approved person, or their authorized designee/representative, that they have worked to the defined instructions and that any related records are true and accurate. The recorded declaration can take many forms (e.g. electronic badge reader, stamp, signature) but must only trace back to a single individual. Where an authorized designee/representative is used to buy-off for other individuals then this shall be defined by internal procedures. If an inspection step is performed by more than one person there must be a record of what each person has inspected but a single representative may buy-off the complete step per internal procedure requirements.

CHEMICAL ETCHING FOR CLEANING: The chemical removal of metal with the intent of removing surface contamination and oxide. Neither AC7108/2 nor AC7108/15 is required for this.

CHEMICAL ETCHING FOR NDT: The process of controlled chemical removal with the intent of removing a small amount of material to open up surface cracks or to reveal a grain structure.

CHEMICAL MILLING: The process of controlled chemical removal of metal to achieve a final dimension.

CONCESSION REQUESTS: A request to the Design Authority that allows for the material to be outside engineering requirements.

CONTAMINANT: An unwanted constituent, to make impure by contact or admixture.

CONTROL LIMITS: Calculated operating limits resulting from statistical process control programs.

CONTROL PLAN: A formalized written plan that intends to control the product characteristics and the associated processing variables. The control plan assures that the good improvements established by your

project will not deteriorate once the project is returned to manufacturing.

CORROSION PIT: For salt spray testing on aluminum panels, the most common type of corrosive attack is pitting -- a highly localized reaction to the salt spray environment resulting in cavities of variable size, shapes and depths. Corrosion pits commonly occur at surface scratches, breaks in protective coatings, and variations in surface compositions (for example, grain boundaries or nonmetallic inclusions) or finishes. After exposure, salt spray test panels should be rinsed and dried cautiously so that any corrosion by-products are not disturbed. Evaluation for corrosion pitting should be conducted as soon as possible after salt spray exposure because continued corrosion activity may occur within observed pits. Typical characteristics of a corrosion pit are, a rounded, elongated or irregular appearance when viewed normal to the test panel surface, a "comet tail" or line or "halo" (i.e., surface discoloration) that emanates from the pit cavity, some quantity of corrosion by-product inside or immediately around the pit (on aluminum test panels the by-product may be granular, powdery or amorphous, and white, grayish or black in color). To be considered a corrosion pit, an observed surface cavity must exhibit at least two of the above characteristics. Surface cavities that exhibit only one of these characteristics may require additional analysis before being classified as a corrosion pit. Visual inspection with 10X magnification is typical practice when corrosion by-products are not visible with the unaided eye. For example, MIL-A-8625 also defines a corrosion pit as having depth greater than its width. Measurement of pit dimensions can be difficult since the extent of a pit is usually not fully revealed from the surface. For example, some typical corrosion pit measurement methods are described in ASTM G 46.

DESIGN AUTHORITY: An organization responsible for the design definition of a part or assembly. The design definition includes the drawing and all referenced specifications required to manufacture the product.

DEIONIZED WATER: 50,000 ohm·cm resistivity minimum or <20 µS/cm. Examples could be water produced by reverse osmosis or ion exchange columns.

DISTILLED WATER: Water that has been produced by the distillation process. Where a process or test specification, within the scope of AC7108 accreditation, requires distilled water to be used, and does not provide any quantitative value of purity, the Chemical Process Task Group has agreed that water having a conductivity of 5µS/cm or less can be used unless otherwise directed by customer.

ENGINEERING REQUIREMENTS: Technical requirements identified in the purchase order, specifications or drawing.

FIRST PIECE: First time processing a specific part number.

FROZEN PROCESS: The shop paper/traveler/work instruction that is pre-approved by the main contractor and cannot be changed without re-approval or repair/MRB authority.

IN PROCESS: Parts have been accepted for processing and released to manufacturing but not yet accepted at final inspection or scrapped. (In process inspections are typically "visual" (water break, uniformity, coverage, etc.) "checks" to determine if parts should proceed to the next processing step.)

INDUCTION TIME: Unless otherwise defined by specification, the time from start of mixing the paint to the allowable start of application to ensure the completion of the catalytic reaction.

INVALID TEST: A test where it can be shown that the test piece was of an incorrect material, or it was processed incorrectly, or it was tested incorrectly.

JOB: All of the hardware processed to a single order control document as a lot or multiple lots with a unique control number.

LABORATORY WATER: For general analysis and testing use or when a specification within the scope of AC7108 accreditation, requires distilled water or de-ionized water to be used for testing or analysis but does not specifically define a purity the Chemical Process Task Group has agreed that water having a conductivity of 5µS/cm or less.

LOT: Where not defined by specification or customer, shall be all parts of the same part number, material, size and shape, processed at the same time, using the same processing materials, under the same conditions in not more than 8 hours and presented for inspection at one time.

MATERIAL CONDITION: This can include the heat treatment condition, the hardness and the surface finish, e.g. shot peened. Depending on the substrate material and process being performed some or all of these conditions may be required to be known.

MATERIAL REVIEW BOARD (MRB): Is authority granted by the Prime contractor to allow sub-contractors to reprocess material under their authority that does not meet drawing requirements, using out of manufacturing sequence steps, to return the material back to drawing requirements. MRB authority may allow material to exceed drawing requirements.

MIXING TIME: The time required to mix multicomponent paints together, excluding any thinners, in order for complete catalytic reaction to occur.

OPERATOR CONTROLLED VARIABLES (OCV): Operator controlled variables (OCV) are process parameters that are directly under the control of the operator.

POLICY: A written company philosophy on how something should be done in very broad generic terms. The existence of a procedure shall satisfy the requirements for a policy.

POT LIFE: Unless otherwise defined by specification or technical data sheet, the time from start of mixing of the paint, or end of induction time for paints having induction time, to when it can no longer be applied.

PROCEDURE: A detailed “how to”, step-by-step revision controlled document used to enforce or implement company policy.

PROCESS CONTROL DOCUMENT (PCD): An internal revision controlled document developed and used by a chemical processor that defines the processing parameters (composition, temperature, time, voltage, current, etc.) for which the Auditee has evidence of compliance to lot and periodic testing requirements. That evidence may be provided by the chemical manufacturer (technical datasheet) or by doing internal testing of test pieces processed to the defined parameters.

PROCESS CONTROL LIMITS: The specification, or PCD, limits beyond which the process must be shutdown.

PROCESS LOAD: The parts that are processed at the same time through the same steps using the same equipment (e.g. Tank A7, Oven B2, IVD Chamber A).

PROCESS PARAMETER: A process parameter is any variable that can influence the process and as such may vary depending on the process in question. For process solutions, examples are: solution temperature, contact/immersion time, concentration of constituents. For painting, examples are: mixing time, induction time, pot life, drying time, oven cure time, humidity and temperature. For electrolytic processes examples are: current density/amperage, voltage and ramp rate. See Appendix D for a list of process parameters that must be recorded either by an automatic system or by the operator.

REFEREE MAGNIFICATION: A higher magnification than that required by the standard inspection procedure. A referee magnification is used to assess an indication when examination at the normal inspection identifies a suspect indication but is unable to establish whether it meets acceptance criteria.

REPAIR - Using approved processing to return material to a usable condition, even though it does not meet drawing requirements. Requires MRB/Customer approval.

REPLACEMENT TEST: A repeat test where the original test can be shown to be an invalid test. A replacement test may be done once without customer permission.

RETEST: A repeat test where the original test result is believed to be wrong but cannot be invalidated. A retest can only be done if permitted by specification or customer. Does not apply to solution analysis

REWORK: Using standard approved processing to return material to drawing requirements before the next processing step.

SHAKING TIME: The time a single pack paint is mixed in its own container or the time the base component of a multi-component paint is mixed in its own container.

SHOP PAPER/ TRAVELER: The paperwork that controls and records the manufacturing process.

SOLUTION CONTROL LIMIT: Where a specification defines nominal solution chemistry but does not define operating ranges, and a commercially available solution is not used, the processor shall define Process Control Limits beyond, which the solution shall not exceed. Product assessment is required if a Process Control Limit is exceeded but customer notification is only required if product impact has been identified.

SYSTEM ACCURACY TEST: See definition in AMS2750

TECHNOLOGY: For the purpose of AC7108, Technologies are each slash sheet, except AC7108/4, in the scope of the audit

TEMPERATURE UNIFORMITY SURVEY (TUS): : See definition in AMS2750.

TEST DATA: Test data is any technical data generated by the Auditee and supported by testing, manufacturer's technical data sheet, or specification, that is used by the processor to control and validate a process.

TEST PIECE: A specific piece of material, or sample of parts, that is processed and assessed/tested to determine the performance or a characteristic of a process. Test pieces are not typically included in the delivered batch.

THERMAL TREATMENT: Any process within the scope of the AC7108 accreditation where the intent of the process is to heat the part/coating, e.g. stress relief, de-embrittlement, hydrogen bakeout, paint/dry film lubricant curing.

NOTE: Part drying is not considered a thermal treatment.

TREND ANALYSIS: The concept of collecting information/data and attempting to spot a pattern or trend, in the information. A negative trend is when trend analysis predicts a diminishing effect to a process or parameter such as a specification limit being exceeded prior to the

	next test being conducted. This does not mean that the specification limit is exceeded, it means that it will be exceeded if no action is taken VALIDATED TESTING FAILURE: Either the original test failed, the test could not be invalidated and a retest was not permitted or the retest, if permitted, or replacement test also failed.			
2.7	**Processes to be approved/Plant Layout:**			
2.7.1	Is there a drawing/sketch defining the location of each process line for which Nadcap Accreditation is sought? *Guidance: The drawing/sketch should not contain specific tank details, it is purely to help define the physical areas covered by the scope of the audit.* **NOTE: Auditor to attach a copy of the drawing/sketch here.**	YES	NO	
2.8	**Company Information** Nature of Business:_____ [ ] Processes in-house manufactured parts [ ] Processes externally manufactured parts Number of QA Personnel:_____ Number of Shifts Worked:_____			
3.	**GENERAL QUALITY SYSTEM**			
3.1	Did the Auditee upload a copy of the documents listed in 2.3.3, to eAuditNet at least 30 days prior to the audit? *Guidance: NA applies if a Verification of Corrective Action Audit (VCA).*	YES	NO	NA
3.2	Does the Specification List, see 2.3.3.3, provided by the Auditee contain all applicable main processing specifications, and all applicable paint material specifications and dry film lubricant material specifications? **NOTE: Auditor to attach a copy of the specification list here.**	YES	NO	
3.3	Continuous Process Improvement			
3.3.1	Has the Auditee identified what chemical process scope data shall be collected and analyzed in order to identify opportunities for improvement? *Guidance: See AS9100D 5.1.2 and 9.1.3 or other similar quality system standards. Such data may include inspection rejects, customer*	YES	NO	

	rejects/complaints, key characteristics, 1st pass yield and process capability data.			
3.3.2	Is there evidence that the identified data is collected on a defined frequency and analyzed on a periodic basis? *Guidance: Current periodic summary data of items defined in 3.3.1, can be control charts, pareto charts, management presentations, project summaries or other presentation methods that summarize the collected data and are reviewed.*	YES	NO	
3.3.3	If the data has shown an opportunity for improvement in the Chemical Process area is the process improvement in progress or has it been implemented? *Guidance: NA applies if the analysis has shown the best opportunities are in non-chemical process areas.*	YES	NO	NA
3.4	Sampling Plans			
3.4.1	Are inspection and test personnel trained in procedures and techniques for deciding what sampling plan to use? *Guidance: NA applies if inspection and test personnel do not decide on the sampling plan to use.*	YES	NO	NA
3.4.2	If used, are Auditee developed sampling plans available for review and approved by the customer when required by contract? *Guidance: NA applies if Auditee developed sampling plans are not used.*	YES	NO	NA

3.5	**Training, Qualification, and Evaluation of Planning, Processing, Inspection, and Testing Personnel** *Guidance: Processing personnel includes all personnel involved in processing the part including masking, blasting, de-masking etc.*			
3.5.1	Has the competency for all personnel functions affecting conformity to chemical process requirements been defined, including processing personnel, testing/inspection personnel and planning personnel?	YES	NO	
3.5.2	For those functions identified in 3.5.1, do records show that training or other actions were taken to achieve the necessary competence?	YES	NO	
3.5.3	Is there evidence that the effectiveness of these actions was evaluated?	YES	NO	
3.5.4	Does the Auditee define and operate a system to ensure competencies are maintained?	YES	NO	
3.5.5	Have operations/tasks that affect conformity to chemical process requirements (e.g. planning, processing, inspection) been performed correctly?	YES	NO	
3.6	**Job Documentation**			
3.6.1	Does shop paper/traveler, which accompanies each lot, contain as a minimum the following information:			
3.6.1.1	Evidence of frozen process approval as required by the customer? *Guidance: NA applies if frozen process is not invoked by the customer.* *Operations defined by the customer as non-critical or non-technical may be exempt from approval requirements.*	YES	NO	NA
3.6.1.2	Relevant purchase order number, purchase order requirements OR identification which is traceable to engineering requirements? *Guidance: The shop paper does not have to reference the PO or contract number, but must have traceability to it, or to the engineering requirements.*	YES	NO	
3.6.1.3	Part identification, quantity of parts, and when required material and/or material condition? *Guidance: The material and/or material condition are required on the traveler unless one of the following applies: it does not influence the process steps/sequence; when the customer specifies the process steps, e.g. repair manual sequence or processing to defined steps on customer traveler; if it is readily available to the operator in some other manner, e.g. drawing; part is an assembly/kit.*	YES	NO	
3.6.1.4	A description of the type and quantity of the Test Pieces when required by the specification?	YES	NO	NA

	Guidance: NA applies if Test Pieces were not required for any of the jobs audited. *Type may be substituted by material and size.* *Reference to a defined Test Piece, e.g. Test Piece drawing, is acceptable.*			
3.6.1.5	A step for each process performed, defining the required operator controlled process parameters/ranges and referencing applicable internal process/or inspection procedure numbers including as applicable:	YES	NO	
3.6.1.5.1	Incoming inspection? *Guidance: NA applies for transfer of work between facilities or departments.*	YES	NO	NA
3.6.1.5.2	Pre-process cleaning method(s)? *Guidance: NA applies if this step is not required for the processes audited.* *Preprocess cleaning is cleaning of incoming parts prior to the primary process i.e. prior to masking/racking, e.g. sandblast, solvent clean.*	YES	NO	NA
3.6.1.5.3	Pre-process thermal treatment? *Guidance: NA applies if this step is not required for the processes audited.*	YES	NO	NA
3.6.1.5.4	Masking? *Guidance: NA applies if this step is not required for the processes audited.*	YES	NO	NA
3.6.1.5.5	Fixturing, racking? *Guidance: NA applies if this step is not required for the processes audited.* *Shop paper to reference internal racking instruction, a general instruction for routine racking or specific details for unique racking requirements as required.*	YES	NO	NA
3.6.1.5.6	In process cleaning, water break free check? *Guidance: NA applies if this step is not required for the processes audited or for barrel plating and automated lines.*	YES	NO	NA
3.6.1.5.7	Activation (e.g. deoxidation, acid clean, abrasive blasting, electrolytic etching)? *Guidance: NA applies if this step is not required for the processes audited.*	YES	NO	NA
3.6.1.5.8	Strike? *Guidance: NA applies if this step is not required for the processes audited.*	YES	NO	NA

3.6.1.5.9	Chemical finishing e.g. Plate, anodizing, conversion coating, passivation, painting, etc.? *Guidance: Some parts may require multiple main processes, e.g. conversion coating and painting.*	YES	NO	
3.6.1.5.10	Post-process steps including cleaning, de-masking and removal of fixturing and racking? *Guidance: NA applies if this step is not required for the processes audited.*	YES	NO	NA
3.6.1.5.11	Post-finishing thermal treatment? *Guidance: NA applies if this step is not required for the processes audited.*	YES	NO	NA
3.6.1.5.12	In-process and final tests and inspections?	YES	NO	
3.6.1.5.13	Final Inspection? *Guidance: This is a review of job documentation to ensure all is correct and possibly a final visual look at the parts. It is not a formal lot test or visual inspection step.*	YES	NO	
3.6.1.5.14	Packaging and handling? *Guidance: NA applies if the part is moved within the same plant.*	YES	NO	NA
3.6.1.5.15	Shipping? *Guidance: NA applies if the part is moved within the same plant.*	YES	NO	NA
3.6.1.6	Documentation of rework that is traceable to the shop paper / traveler and all processing performed on the parts? *Guidance: NA applies if no rework observed during the audit.*	YES	NO	NA
3.6.1.7	Do buy-off steps comply with AC7108 Appendix E, and were they properly bought off and dated?	YES	NO	
3.6.1.8	Are all process parameters defined in AC7108 App D recorded for each process load and traceable to the route card/traveler? *Guidance: NA applies if the Design Authority has specifically stated that the process parameters need not be recorded.*	YES	NO	NA
3.6.1.9	Lot inspection and test results are recorded and bought off by the person carrying out the inspection/test or their designee/representative? *Guidance: Where more than one person carries out an inspection step the inspection records shall identify each person, however, the inspection step on the traveler may be bought off by a single designee/representative per internal instructions.*	YES	NO	

3.7	**Process and Quality Planning** *(shading removed due to 3.7.5 not being modified question)*			
3.7.1	Is there a procedure defining system/requirements for process and quality planning which effectively ensures compliance with customer and/or specification requirements?	YES	NO	
3.7.2	Are there instructions for actions to be taken by the operator, inspector, or any other personnel, when a discrepancy is detected?	YES	NO	
3.7.3	Is there a Process Control Document (PCD) for each process that defines operations and controls to ensure compliance with applicable specifications and repeatable end item inspection tests?	YES	NO	
3.7.3.1	Does the PCD contain as a minimum the following elements?	YES	NO	
3.7.3.1.1	Composition of all materials to be used, including allowable solution control ranges to be used for solution analysis? *Guidance: NA applies if the Auditee is not required to control composition of any materials in their audit scope, e.g. audit is paint only.*	YES	NO	NA
3.7.3.1.2	Description of allowable ranges for applicable process parameters for each step in the processing sequence; for example, immersion time, solution temperature, current density, voltage, paint agitation time, etc.? *Guidance: Solution control and process parameter ranges specified in a PCD must comply with applicable specification or customer requirements. The traveler may define tighter limits than the PCD to ensure specification compliance for a particular job.* *When applicable specifications do not describe allowable solution control or process parameter ranges, Auditee must base solution and process controls on technical data.* *Recommendations of the applicable product manufacturer's technical datasheet are considered to be acceptable technical data.* *Test Data that shows compliance with end item inspection or customer requirements when operating the solution/process within the range specified in the PCD.*	YES	NO	
3.7.4	Does the quality planning address removal of defective or nonconforming platings and coatings and their reapplication (rework) to preclude part life degradation or nonconforming part dimensions? *Guidance: NA applies when plating and coating is not performed or where rework is not observed during the audit.* *The Auditee is not required to have standard rework instructions, it is acceptable for a rejection to be assessed and rework planning then created. This methodology and the requirements for customer approval of rework should be defined in the Auditee's procedures.*	YES	NO	NA

3.7.5	Are jobs processed to the specification revision defined on the purchase order, or if the purchase order is silent on revision level, to the specification revision active at the time of the purchase order? *Guidance: If working to the latest revision, the Design Authority may provide an implementation timeframe. If the specification is cancelled or superseded, the Auditee must get guidance via their contract review system of how to proceed.*	YES	NO	
3.8	**Purchasing-Source Selection**			
3.8.1	Are all sub-tier suppliers that provide any consumable material, or service used in the process, taken from an approved supplier list?	YES	NO	
3.8.2	Are all solution analysis and process control testing sources approved in accordance with an internal procedure meeting all contractual requirements? *Guidance: NA applies if no subcontract analysis or testing is done.* *For jobs audited, outside laboratory testing is performed by a laboratory that is approved to Prime customer requirements. If no Prime requirement, then one of the following must be met:* *a)Any Prime customer laboratory approval (scope does not need to match).* *b)MTL accreditation or any MTL recognized approval (scope does not need to match).* *c)AC7108/4 accreditation (scope does need to match).* *d) Manufacturers that provide solution analysis and process control testing for their proprietary solutions may be exempt from this requirement provided the following criteria are met: they are the original manufacturer [not a distributor]; testing is provided as a service with the supply of the solution; they have an in-house laboratory and evidence that a quality management system accreditation (Example: AS/EN/JIS Q 9100, ISO 9001) is held.*	YES	NO	NA
3.9	**Receiving Procedure**			
3.9.1	Does the processor obtain through customer-provided information: part identification, material type and any other part specific information required for subsequent processing? *Guidance: NA applies only if the traveler states that this is the next operation and the work being performed is being bought off in the same traveler* *A yes answer would be a work instruction or a place on their traveler looking for information that is critical for their processing, e.g. hardness for steel materials, shot peened surfaces, alloy composition.*	YES	NO	NA

3.9.2	Does the system provide for holding and segregation of hardware pending receipt of proper material documentation or if nonconformance is detected?	YES	NO	
3.9.3	Does the Auditee have incoming inspection procedures identifying characteristics to be checked and methods to be used, including sampling plan as defined in the quality manual? *Guidance: NA applies if parts are transferred internally.*	YES	NO	NA
3.9.4	Are actual as-received dimensions for jobs having post-processing dimensional requirements determined prior to processing? *Guidance: NA applies only if post-processing dimensional requirements are not contractually required.* *Actual pre-process dimensions may be provided by earlier machining inspection or by customer* *Some customers may require the processor to measure the actual dimension directly prior to processing.*	YES	NO	NA
3.9.5	Does incoming material quality planning provide for shelf-life monitoring and control for materials that so require? *Guidance: NA applies if no materials requiring shelf-life control are used.*	YES	NO	NA
3.10	**Housekeeping**			
3.10.1	Are the company's facilities clean, uncluttered, and well lighted?	YES	NO	
3.10.2	Are incompatible materials such as acids/alkalis or oxidizers/organics segregated in storage?	YES	NO	
3.10.3	Are materials used in the processing and testing of parts clearly labelled with their contents, batch number and expiry date as applicable? *Guidance: Not applicable to containers used for transfer, or non-production materials.*	YES	NO	
3.10.4	Are materials used in the processing and testing of parts stored to preclude damage or degradation from heat, cold, water, atmospheric moisture or other environmental considerations?	YES	NO	
3.10.5	Are materials used in the processing and testing of parts that are transferred from original manufacturer's containers, labelled to maintain identity, batch traceability and original or reduced expiry date? *Guidance: NA applies when the material is transferred to a container for immediate use.*	YES	NO	NA

3.10.6	Does training or a procedure address cleaning of pumps and other transfer equipment after use to preclude material contamination and for operator safety? *Guidance: NA applies if transfer equipment is not used.*	YES	NO	NA
3.11	**Control of Non-Conforming Parts**			
3.11.1	Is there a policy to ensure that customers are informed of discrepancies affecting hardware? (i.e. out of tolerance conditions)	YES	NO	
3.11.2	Is rework approved by the customer when required? *Guidance: NA applies when there is no Design Authority requirement for rework approval or where no rework was observed in the audit.*	YES	NO	NA
3.11.3	Is there a rework procedure that requires planning/shop paper to be issued defining all processing performed on the part, including stripping, inspection following stripping and reprocessing? *Guidance: NA applies if the Auditee does not perform rework.*	YES	NO	NA
3.11.4	Is repair/MRB always approved by the customer? *Guidance: NA applies if the Auditee has MRB authority or where no repair work was observed in the audit.*	YES	NO	NA
3.12	**Product Packaging & Delivery** *Guidance: NA applies if parts are transferred internally.*	SECTION NA		
3.12.1	Is there a procedure to provide for the protection of parts after final inspection and during shipment that includes customer requirements?	YES	NO	
3.12.2	Do shipping documents conform to purchase order requirements or contracts?	YES	NO	
3.13	**Calibration and Verification of Processing and Testing Equipment** *Guidance: Specific calibration and verification requirements are defined in the appropriate part of this Audit Criteria and slash sheets. To check NO to any of the questions in this section requires an associated NO in the specific parts of this Audit Criteria or slash sheets.*			
3.13.1	Is there evidence of current calibration/verification for:			
3.13.1.1	All shop equipment used to set, control or monitor the control of a process?	YES	NO	
3.13.1.2	All test and inspection equipment, including measurement standards, used to accept product or control a process?	YES	NO	
3.13.1.3	Does the frequency of recalibration/reverification of equipment and measurement standards ensure continuous compliance?	YES	NO	

3.13.1.4	Except for instruments used to control or record time, does the calibration cover the range of use and the required instrument accuracy?	YES	NO
3.13.1.5	For instruments used to control or record time, does the calibration cover the range of use and the required instrument accuracy; or for actual time function and time durations ≥ 1 hour, is the instrument accurate to ±1 min/h as shown by calibration or comparison to time instrument with NIST-traceable calibration?	YES	NO

4.	**LOT TESTING, PERIODIC TESTING & SOLUTION ANALYSIS**			
4.1	Lot Testing *Guidance: Lot testing, other than visual inspection, shall be audited in accordance with the relevant section of AC7108/4 Appendix B. Where Appendix B does not have an applicable section then section B23 – Other Testing shall be used.*			
4.1.1	Was the lot testing observed in the audit performed in accordance with the method defined by the process/test specification and correctly dispositioned?	YES	NO	
4.1.2	Was the sample size used for lot testing in accordance with the process/test specification?	YES	NO	
4.1.3	If test pieces were used for lot testing, were they of the correct material, correct dimensions and traceable to the material from which they were made? *Guidance: NA applies if lot testing reviewed in the audit did not use test pieces.* *Material traceability is not required for lot thickness testing.*	YES	NO	NA
4.2	Periodic Testing *Guidance: Section NA applies if periodic testing is not required.* *Periodic testing shall be audited in accordance with the relevant section of AC7108/4 Appendix B. Where Appendix B does not have an applicable section then section B23 – Other Testing shall be used.*		SECTION NA	
4.2.1	Was the periodic testing reviewed in the audit performed in accordance with the method defined by the process/test specification and correctly dispositioned?	YES	NO	
4.2.2	Are periodic test results, including test methods/specifications, reviewed, bought off and dated by an authorized person? *Guidance: The person who carries out the test may also be authorized to review and buy-off the test results.*	YES	NO	
4.2.3	Was the quantity of test pieces used for periodic testing in accordance with the process/test specification?	YES	NO	
4.2.4	Were test pieces used for periodic testing of the correct material, correct dimensions and traceable to the material from which they were made? *Guidance: Material traceability is not required for periodic thickness testing.*	YES	NO	
4.2.5	Were the periodic tests (both internal and external) reviewed in the audit performed at the frequency required by the controlling specifications, including Appendix G?	YES	NO	

	Guidance: Appendix G identifies Chemical Process Task Group requirements for periodic tests where the frequency is not defined by the industry specifications and Nadcap definitions for time intervals and allowable extensions – the latter are invoked by OP 1105 and defined in OP 1103.			
4.2.6	Are periodic test results available at the same frequency as the periodic test pieces are processed? *Guidance: If test pieces are processed monthly then the test results must be available monthly. The Auditee must not retain processed test pieces for several periods and then combine them for testing.*	YES	NO	
4.2.7	Are periodic testing records maintained such that they are traceable to both shop travelers and certification/test report and would they enable the Auditee to reconstruct the test samples or testing conditions and identify any incorrectly tested material?	YES	NO	
4.2.8	Are testing records maintained and organized in a manner in which they are readily available for review?	YES	NO	
4.2.9	Are periodic test results graphed or tabulated, examined for trends, and are negative or questionable trends acted upon? *Guidance: All periodic test results, quantitative and pass/fail shall be considered.* *Test results shall be graphed or tabulated each time a result is obtained to allow for trend review and identify negative/questionable trends.* *Evidence of examination for trends will be the correction of a negative trend – see Section 2.6 TREND ANALYSIS.*	YES	NO	
4.3	If a test is performed by a sub-tier provider, does the Auditee review the test certificate for compliance of test results, including test methods/specification, and does he buy-off and date the certificate as proof of review? *Guidance: NA applies if no testing is performed by a sub-tier provider.*	YES	NO	NA
4.4	Are errors in the internally generated test data corrected by either; line out, write correction, initial and date, or, void the data, make corrections, and retype/reprint? *Guidance: When data is voided then the old file/paper/data should still exist giving traceability. The new file/paper/data can have the corrections made and then can be saved or reprinted/retyped if required.*	YES	NO	

4.5	Is there a procedure which requires in the event that an error is identified in the certificate of test, test data or testing procedure; identification of error cause, implementation of corrective actions, notification of affected customers, retesting and correction of certification/test data?	YES	NO	
4.6	Test Piece Control *Guidance: Section NA applies if no test pieces are required for specifications within the scope of the audit.*		SECTION NA	
4.6.1	Are material certifications, manufacturer's labels, or the materials themselves verified against the Auditee's purchase order to ensure receipt of correct material? *Guidance: NA applies if no test pieces are purchased.*	YES	NO	NA
4.6.2	Are test pieces traceable to material from which they are made? *Guidance: NA applies if all test pieces are provided by the customer.* *Test pieces used for lot thickness testing do not require traceability.*	YES	NO	NA
4.6.3	Are test pieces positively identified during all stages of processing and testing until disposed of (tags, bags, etc)? *Guidance: Test pieces may be identified by Job #, S/N, or any form of identification that can be traced back to the router/traveler.* *Test pieces do not need to be identified during actual processing or testing so long as there are controls to ensure they are correctly re-identified, e.g. bagged and tagged, after processing/testing.*	YES	NO	
4.6.4	Are all periodic test pieces provided for testing (internal/external lab) accounted for (e.g., tested to completion/failure, or replaced)? *Guidance: NA applies if the Auditee does not process periodic test pieces.*	YES	NO	NA
4.6.5	Is there documentation which provides for tracking and accountability of all periodic test pieces currently in work (processing and testing)? *Guidance: NA applies if the Auditee does not process periodic test pieces.* *A router should be with every test piece describing the process and all of the variables to make sure that it is representative of the part.*	YES	NO	NA

4.6.6	Is there specific shop paperwork (router, etc.) which is traceable to the test pieces which specifies how they are to be processed and which tank they are processed in?	YES	NO	
4.6.7	Unless otherwise authorized by the Design Authority, are all process parameters associated with the processing of the test pieces recorded, traceable to the specific samples/specimens, and retrievable? *Guidance: NA applies if the Design Authority has indicated that parameters associated with processing of test pieces are not required to be recorded.* *If test pieces are not processed with hardware, ensure that the process steps represent the production process. If specification requires test pieces to be processed with hardware, ensure that this is being performed.*	YES	NO	NA
4.7	Test Failure, Replacement Testing and Retesting of Periodic Test Pieces *Guidance: Section NA applies if periodic testing is not required.* ***NOTE**: This section does not apply to solution analysis.*	SECTION NA		
4.7.1	Does the Auditee have a documented procedure that defines actions to be taken in the event of a periodic test failure and does it contain: *Guidance: See the Chemical Processing Audit Handbook for example of procedure.*	YES	NO	
4.7.1.1	Definitions for "Invalid Test", “Replacement Test” and “Retest”?	YES	NO	
4.7.1.2	The need for an investigation to determine if the test failure is “Invalid”?	YES	NO	
4.7.1.3	The requirement that a replacement test is only performed when the test failure is conclusively shown, and documented, to be “Invalid”?	YES	NO	
4.7.1.4	The requirement that a retest is only performed when permitted by customer or specification?	YES	NO	
4.7.1.5	The requirement that the original test failures, replacement tests, nonconforming tests, and retests are logged and cross indexed, including explanations with entries signed off by authorized personnel?	YES	NO	
4.7.1.6	The requirement that the test failure log is reviewed at least quarterly for trends which might indicate deterioration of test procedures, methodologies and/or processing/test equipment?	YES	NO	
4.7.2	Review of Test Failure Data *Guidance: NA applies only if no test failures are observed.*	SECTION NA		
4.7.2.1	Are replacement tests performed only when original failed test has been shown to be invalid and are retests only performed only when permitted by customer and/or specification?	YES	NO	

4.7.2.2	Are original test failures, replacement tests, retests and validated test failures logged and cross indexed, including explanations with entries signed off by authorized personnel? (i.e., Replacement / Retests traceable to the original tests)	YES	NO	
4.7.2.3	If negative trends are apparent from the test failure log have corrective actions been applied, or is there evidence of active investigation into the cause(s) of the negative trend? *Guidance: An NA applies if there is no evidence of negative trends.*	YES	NO	NA
4.7.3	Is there a procedure which addresses the following in the event of a validated testing failure:	YES	NO	
4.7.3.1	Immediate notification of all affected customers? *Guidance: Immediate is notification within customer defined timeframes and typically within 3 working days*	YES	NO	
4.7.3.2	Identification of all affected hardware shipped to the customer?	YES	NO	
4.7.3.3	Segregation of all affected in-house hardware?	YES	NO	
4.7.3.4	Immediate shutdown of the affected process/process line pending resolution?	YES	NO	
4.7.3.5	Investigation of failure cause and implementation of corrective action?	YES	NO	
4.7.3.6	After the process has been corrected is it tested to show compliance to requirements before production is resumed? *Guidance: Limited processing may be re-started after correction prior to test results being obtained if the customer agrees to "at risk" release or parts are held at the Auditee pending test results.*	YES	NO	
4.7.4	If there has been a validated testing failure is there evidence that the procedure has been followed? *Guidance: An NA applies if there are no test failures.*	YES	NO	NA
4.8	Control of Processing Solutions *Guidance: Section NA applies if control of process solutions not required, e.g. scope only includes painting or local application processes.* *This section covers the control of process solutions based on the analysis results. AC7108/4 addresses the actual doing of solution analysis.*		SECTION NA	

4.8.1	Are there assigned responsibilities for review and approval of analysis results, authorization of re-analysis, calculation of process solution additions and corrections, and the preparation and approval of analysis procedures as required?	YES	NO
4.8.2	Are these responsibilities performed by a qualified individual (Refer to section 3.5) and are their job responsibilities, job specification and qualifications documented? *Guidance: If there is no on-site technical expertise in simple chemical analysis techniques, witness a typical titration or other test to confirm minimal skill levels in using a pipette, reading a burette, standardizing a pH meter, etc.*	YES	NO
4.8.3	Is there a procedurally defined process to ensure solutions are maintained within the concentration/property limits defined by applicable specifications or Process Control Document (PCD) and a system for adjusting frequency of analysis/testing based on rate of change? *Guidance: The process will need to ensure the limits of all applicable specifications/(PCD) are accounted for.* *Specification identified contaminant limits are concentration limits.* *PH, conductivity, refractive index, are examples of solution properties..* *ARP4992 is an example of a system for controlling solution composition based on rate of change.* *When permitted by specification alternative methods to solution analysis may be used to control a process solution, e.g. etch rate, specific gravity, refractive index, dump when ineffective based on a defined control test.*	YES	NO
4.8.4	Do internal procedures define tank make-up quantities/method and addition calculations?	YES	NO
4.8.5	Do internal procedures ensure tank samples are representative of a working tank, i.e. collection when the tank is within the defined operating temperature, within operating level, is uniform, and prevents sample contamination? *Guidance: Tank may require agitation prior to sampling to ensure uniformity.*	YES	NO
4.8.6	Do the solution control records contain the following information for each tank monitored:	YES	NO
4.8.6.1	Tank Identification?	YES	NO
4.8.6.2	Tank Contents?	YES	NO
4.8.6.3	Tank size (working volume) and level? *Guidance: The working volume shall be defined in the records but the level may be marked, or automatically controlled, in the tank.*	YES	NO

4.8.6.4	Analysis frequency?	YES	NO
4.8.6.5	Constituents to be analyzed and/or properties to be tested? *Guidance: This may be a particular chemical (e.g. OH^-, $Cr04^{2-}$), etch rate, pH, conductivity, if that is how the solution is controlled.* *Etch rate for the purpose of determining process time of production work to remove a defined amount of material is not solution analysis and is addressed in the relevant slash sheet, e.g.AC7108/2, AC7108/5.*	YES	NO
4.8.6.6	Are operating limits based on, multiple where applicable, specification/technical datasheet requirements, e.g. concentration range(s), pH range, conductivity range, etch rate? *Guidance: The Chemical Process Audit Handbook provides an example of a Solution Matrix which may be used as a tool to help meet this requirement.*	YES	NO
4.8.6.7	Date sampled and analyzed?	YES	NO
4.8.6.8	Analysis result (e.g. titration value, refractive index value) and calculated constituent values? *Guidance: If the Auditee is using equipment whose output is the constituent value, e.g. auto-titrator, or the analysis is subcontracted, then only the constituent value needs to be recorded.*	YES	NO
4.8.6.9	Additions and corrections? *Guidance: Corrections are removal of solutions for the maintenance of controls, for example- electroless nickel.*	YES	NO
4.8.6.10	Tank dumps?	YES	NO
4.8.6.11	Reanalysis after addition when out of specification limits?	YES	NO
4.8.6.12	Identity of individual conducting analyzes, additions, reanalysis and dumps?	YES	NO
4.8.7	Do solution control records demonstrate:	YES	NO
4.8.7.1	Solution constituents/properties are analyzed/tested at the defined frequency?	YES	NO
4.8.7.2	Solutions constituents/properties are maintained within specification/PCD limits? *Guidance: Isolated out of specification/PCD limits due to special causes is not an NCR against this question.*	YES	NO
4.8.7.3	The process is stopped when any constituent/property does not comply with specification/PCD limits, or is likely to go outside the limits before the analysis result is obtained?	YES	NO

	Guidance: If the solution went outside specification/PCD limits, or trend analysis indicated it likely went outside limits, check what was done to prevent hardware being processed.		
4.8.7.4	The process is not restarted until the constituent/property is brought into compliance?	YES	NO
5.	**PROCESS EQUIPMENT CONTROL AND MAINTENANCE**		
5.1	**General**		
5.1.1	Are current operating manuals or instructions available to operators, maintenance personnel, and other personnel who require the information?	YES	NO
5.2	**Maintenance Procedures**		
5.2.1	Are maintenance procedures prepared with preventative maintenance as a goal and based on prior maintenance records? *Guidance: The goal of the maintenance program is to minimize downtime due to equipment failure. The facility maintenance program should include scheduled equipment review and/ or actions based on equipment manufacturer's recommendations and equipment breakdown and repair histories. The procedure and records need to show periodic reviews of maintenance history and preventative actions taken based on those reviews.*	YES	NO
5.2.2	Do records indicate that maintenance has been performed in accordance with a defined schedule?	YES	NO
5.3	**Process Line Equipment** *Guidance: Section NA applies if the processes in the scope of the audit do not include tanks.*	SECTION NA	
5.3.1	Are tanks and/or work surfaces maintained free of corrosion and chemical spillage detrimental to the process?	YES	NO
5.3.2	Are spray and immersion rinse tanks: *Guidance: NA applies for processes that do not utilize spray rinses or tanks.*	SECTION NA	
5.3.2.1	Clean, clear, free-running or monitored for contamination levels? *Guidance: Does not apply to drag-out tanks if adequate rinsing is provided afterward.*	YES	NO
5.3.2.2	Situated in a sequence to prevent cross contamination of process tanks?	YES	NO
5.3.2.3	Assuring adequate neutralization and/or removal of process chemicals? *Guidance: Particular attention must be given to parts such as small diameter tubes. Processor should have or make provision for auxiliary rinsing.*	YES	NO

5.3.3	Is there a system to ensure tanks with defined operating temperature ranges are maintained within the defined temperature range and that the recording system is sufficient to demonstrate compliance to requirements? *Guidance: NA applies for processes that do not utilize heated or cooled tanks.* *The control and recording process needs to account for environmental temperature changes (summer/winter, night/day) and also temperature changes as a result of endothermic and/or exothermic reactions during actual processing of hardware. Different control and recording systems may be used based on the requirements and characteristics of individual tanks.* *The method used to capture temperature must be capable of showing that the solution was within the required temperature parameters under processing load conditions.*	YES	NO	NA
5.3.4	If tank temperatures are not recorded during the processing of actual production loads, does the Auditee have objective evidence that the control system will maintain the tank temperature within the defined operating range under maximum load conditions? *Guidance: NA applies for processes that do not utilize heated or cooled tanks or if tank temperatures are recorded for every load.* *Objective evidence could be a record of tank temperature when operating the tank at maximum load. The maximum load shall be the capacity of the rectifier unless an alternative restriction is defined in the process instruction.*	YES	NO	NA
5.3.5	Are hoists and other lifting equipment labeled as to capacity? *Guidance: NA applies if no hoists or lifting equipment is used.*	YES	NO	NA
5.3.6	Is work electrically isolated from the electrical power supply of hoists and other lifting equipment if that equipment is left connected to the work during processing? *Guidance: NA applies if; no electrically powered hoists or lifting equipment are used, electrically powered hoists or lifting equipment is disconnected during processing, or immersion time is so short that isolation of the work is not practical.* *The requirement applies to all aqueous immersion processes whether electrolytic or not.* *This may be achieved by insulation techniques or periodic electrical leakage checks*	YES	NO	NA
5.3.7	Does the de-ionized water system deliver water that is ≥ 50,000 ohm-cm resistivity (≤ 20 µS/cm conductivity) as demonstrated using a calibrated inline sensor or periodic analysis? *Guidance: NA applies if no deionized water is required.*	YES	NO	NA

	50,000 ohm-cm = 20 micro-mhos/cm (approx10 ppm or mg/L TDS). Any combination of water purification methods may be used to meet the resistivity requirement. In-house deionizer units need either a calibrated red/green light of the correct resistivity value, a calibrated meter capable of read-out of actual resistivity, or the water confirmed by periodic chemical analysis or use of a total Dissolved Solids (TDS) meter, calibrated with known standards.			
5.4	**Ovens for Thermal Treatments at a set point above 250ºF (121ºC)** *Guidance: NA applies if processing does not require thermal treatments above 250°F (121°C).* *See Section 2.6 for the definition of Thermal Treatment. Part drying is not considered a Thermal Treatment.* *The only pyrometry requirements to be verified are those required to answer the following questions.* *If the customer specification requires compliance to AMS2750 for control of the oven, contact your customer to determine if an additional audit to AC7102/8 is required.*			SECTION NA
5.4.1	From 01-July-2022, are all instruments (controller, over-temperature controller, recorder, timer) digital? *Guidance: NA applies if it is not yet 01-Jul-2022.*	YES	NO	NA
5.4.2	For each oven that operates at a set point above 250ºF (121ºC), does the Auditee identify:	YES	NO	
5.4.2.1	The oven ID?	YES	NO	
5.4.2.2	The operating range?	YES	NO	
5.4.2.3	The uniformity requirement?	YES	NO	
5.4.2.4	The qualified working zone?	YES	NO	

	Guidance: The qualified working zone is defined by the placement of thermocouples for the TUS. Parts must be placed within this zone.			
5.4.3	Does the defined operating range and uniformity requirement meet specification requirements for which the oven is used?	YES	NO	
5.4.4	Are parts only placed within the qualified working zone of the oven?	YES	NO	
5.4.5	Does the oven have at least one temperature control sensor in each control zone, attached to a control instrument that controls and displays temperature?	YES	NO	
5.4.6	Does the oven have a recording instrument that records the temperature and time for each control zone?	YES	NO	
5.4.7	Does the oven have over-temperature protection in each control zone?	YES	NO	
5.4.8	Are instrument (temperature controller, overtemperature controller, time and temperature recorder) calibrations performed in accordance with, or certified to, AMS2750?	YES	NO	
5.4.8.1	For digital instruments, is temperature calibration accuracy ±2°F (±1.1°C), or ±1°C if the instrument only displays whole numbers, or ±0.2% of the test temperature reading, whichever is greater?	YES	NO	
5.4.8.2	For analogue instruments, is temperature calibration accuracy ±2°F (±1.1°C), or ±0.3% of maximum defined operating temperature, whichever is greater, and is sensitivity within 3°F (1.7°C)? *Guidance: NA applies is there are no analogue instruments.*	YES	NO	NA
5.4.8.3	Are temperature instrument calibration frequencies at least semi-annually for digital instruments and quarterly for analogue instruments?	YES	NO	
5.4.8.4	Is the timing function for all digital recording instruments and data acquisition systems accurate to ±1 min/h as shown by calibration or comparison to time instrument with NIST-traceable calibration? *Guidance: NA applies if digital recording/data acquisition instruments are not used.*	YES	NO	NA
5.4.8.5	Is the timing function for all digital recording instruments and data acquisition systems calibrated annually, or verified monthly by synchronization of the timing systems to NIST (or international equivalent) via satellite, internet, or telephone? *Guidance: NA applies if digital recording/data acquisition instruments are not used.*	YES	NO	NA
5.4.8.6	Are chart recorder (circular and strip) speed(s) calibrated/verified at least annually and accurate to within ±3 minutes per hour? *Guidance: NA applies if chart recorders are not used.*	YES	NO	NA
5.4.8.7	Is resolution of the chart recorder equal to or better than ±10ºF (±6ºC)?	YES	NO	NA

	Guidance: NA applies chart recorders are not used.			
5.4.9	Are system accuracy tests (SATs) performed in accordance with, or certified to, AMS2750? *Guidance: Also called a Probe Check.*	YES	NO	
5.4.9.1	Was a SAT performed after any maintenance that could affect the SAT result? *Guidance: Examples include replacement of thermocouple(s) and re-calibration of the instrument when any adjustment has been made.*	YES	NO	
5.4.9.2	Are SATs performed bi-weekly, or less frequently if the oven maintenance and control meets requirements in AMS2750 for the frequency performed? *Guidance: It is the Auditee's responsibility to demonstrate compliance to requirements if less frequent SATs are performed.* *If an oven is used infrequently at a set point above 250°F (121°C) then check that an SAT has been done no more than 2 weeks prior to use.*	YES	NO	
5.4.9.3	Do SAT results demonstrate an accuracy of ±5°F (±2.8°C), or ±0.5% of the test temperature, whichever is greater?	YES	NO	
5.4.10	Are temperature uniformity surveys (TUSs) performed in accordance with, or certified to, AMS2750?	YES	NO	
5.4.10.1	If the highest and lowest test temperatures are more than 600°F (335°C) apart, are uniformity surveys performed at a temperature within each range as defined during the initial survey? *Guidance: NA applies if the qualified operating range is not more than 600°F (or 335°C).*	YES	NO	NA
5.4.10.2	Over a period of 12 months, are TUSs performed at the minimum and maximum temperatures of the qualified operating range? *Guidance: Ovens that operate at a single set point will only require a TUS at that set point.*	YES	NO	
5.4.10.3	Are TUSs performed at least quarterly, or less frequently if the oven maintenance and control meets requirements in AMS2750 for the frequency performed? *Guidance: It is the Auditee's responsibility to demonstrate compliance to requirements if less frequent TUSs are performed.*	YES	NO	
5.4.10.4	Do TUS results demonstrate the uniformity meets ±25°F (±14°C), or the process specification requirement, whichever is tighter?	YES	NO	

	Guidance: Where the specification gives a range, such as 275-300°F (135-149°C) then this is considered the allowed set point range.	
5.4.11	Does the Auditee have a procedure/instruction for each pyrometry test (instrument calibration, SAT, TUS) that is performed internally and is the procedure/instruction compliant to AMS2750 and does it indicate compliance to AMS2750? *Guidance: NA applies if all pyrometry tests are done by a sub-tier provider.*	YES NO NA
5.5	**Ovens for Thermal Treatments with a set point at or below 250ºF (121ºC) or for Miscellaneous Heating Processes, e.g. Part Drying.** *Guidance: NA applies if no thermal treatments at or below 250ºF (121ºC) or other miscellaneous heating processes are performed within the scope of the audit or if these treatments are performed in an oven controlled to section 5.4.* *Equipment that is not fully enclosed but provides this type of thermal treatment shall be considered as an oven for the purpose of the audit.*	SECTION NA
5.5.1	Are temperature controllers calibrated? *Guidance: NA applies if the thermal treatment equipment is engineered to provide the required temperature without the use of a temperature controller.*	YES NO NA
5.5.2	Do procedures require and records show a periodic check is performed to ensure the minimum (if specified) and maximum temperatures within the qualified working zone meet requirements? *Guidance: The qualified working zone is defined by the placement of the thermocouples used to do the periodic check, parts must be placed within this zone.* *For certain equipment (e.g. spin dryers, conveyor ovens) a periodic temperature survey is not feasible and periodic testing of parts on removal from the dryer is acceptable to prove the temperature does not exceed requirements.* *If there is no minimum temperature requirement and the drying space is fed by heated air, then a periodic check of the input air temperature is acceptable.*	YES NO
5.6	**Stripping** *Guidance: Section NA applies if stripping is not performed within the scope of the audit.*	SECTION NA
5.6.1	Do chemical stripping baths include an inhibiting agent when required by specification or customer? *Guidance: NA applies when inhibiting is not required by specification or customer.*	YES NO NA

5.6.2	Does the hardware receive an embrittlement relief bake after chemical stripping as required by specification and/or customer requirement? *Guidance: NA applies when embrittlement relief baking is not required or when chemical stripping is not performed.*	YES	NO	NA
5.6.3	Are masking, insulators, or similar methods being used to prevent Galvanic Coupling of dissimilar metals? *Guidance: NA applies if not performing chemical stripping or there are no dissimilar metal couples.*	YES	NO	NA
5.6.4	If required by the customer, has the stripping of parts and the process been approved? *Guidance: NA applies if customer approval is not required.*	YES	NO	NA
5.6.5	For each strip cycle, are all stripping operations appropriately planned, processing documented, and traceable to the hardware?	YES	NO	
5.6.6	When stripping is not part of the standard process, has the reason for each strip been recorded on the individual part/lot documentation and the rework properly authorized (by appropriate authorities) and the need for corrective action considered? *Guidance: This question applies if stripping is required due to nonconformance after plating/ coating.* *NA applies if stripping is the expectation of the customer as defined in the purchase order or drawing.*	YES	NO	NA
5.6.7	Is there a procedure for mechanical stripping that defines process controls when it is performed? *Guidance: NA applies if no mechanical stripping is performed.*	YES	NO	NA
5.6.8	Do strip procedures include an inspection of the stripped component following the strip operation? *Guidance: Inspection may include dimensional, surface finish, complete removal of coating, etching and damage.*	YES	NO	
5.7	**Inspection**			
5.7.1	Do the lot inspection and lot test procedures require sufficient data to be recorded to demonstrate that the sample size and acceptance criteria were fully met, and that results are traceable to the person(s) who actually did the inspection/test? *Guidance: Recording of just an average may not be acceptable to demonstrate each item measured met the acceptance requirement. In process checks, e.g. coating thickness, that are done to aid processing do not require recording.*	YES	NO	

Appendix A content is no longer referenced from the Audit Criteria and has been deleted.

APPENDIX B – TEST METHODS

This appendix has moved to AC7108/4.

APPENDIX C – EXAMPLE TEST MATRIX

The example Test Matrix has been removed from here and placed in the Chemical Process Audit Handbook.

APPENDIX D – PROCESS PARAMETERS TO BE RECORDED

***Note**: Temperature is required to be recorded in a manner that meets paragraph 5.3.3 of this Audit Criteria.*

Pre-Cleaning

None as long as method is non-etching. Process sheet must specify the maximum time.

Immersion/Contact Time if etching.

Masking

It is only necessary to record the masking family, e.g. tape, lacquer, bung, etc.

If the masking material is specifically defined on the shop papers then there is no need to record it.

Abrasive Blasting

Media

Pressure

Offset distance

Cleaning

None so long as method is non-etching. Process sheet must specify the maximum time.

Immersion/Contact Time if etching

Rinsing

None

De-Oxidize/Pickle

Immersion Time

Electrolytic Clean

Immersion time

Voltage or Amperage - as required by specification.

Surface area if current density (amperage) controlled.

Anodic/Cathodic/Reversing unless it is fixed.

Acid Desmut

None for dilute acid solutions used for alkaline etch desmut or neutralizing. Process sheet specify maximum immersion time.

Etching

Immersion/Contact Time

Voltage or Amperage - as required by specification.

Surface area if current density (amperage) controlled.

Chemical Milling

Immersion Time

Conversion Coating

Immersion Time

Electroless Plating

Immersion Time

Anodize

Ramp up data for each ramp and hold step (e.g. time ramp starts and time ramp finishes or duration of ramp).

Voltage or Amperage - as required by specification.

Surface area if current density (amperage) controlled.

Anodize Time

Ramp down data (e.g. time ramp starts and time ramp finishes or duration of ramp).

Sealing/Dying

Immersion Time

Barrel Plating

Voltage or Amperage - as required by specification.

Surface area if current density (amperage) controlled.

Time

Brush Plating

Surface Area

Solution Type

Voltage

Ampere Hours

Electroplating

Strike voltage or amperage

Ramp up data for each ramp and hold step (e.g. time ramp starts and time ramp finishes or duration of ramp)

Plating voltage or amperage – as required by specification

Surface area – if strike or plating are controlled by amperage.

Time

NOTE: Where a cathometer is used to control the plating current density the actual current density, rather than amperage, shall be recorded.

Painting/Dry Film Coating

Batch # of each paint component

Batch # of thinners if part of a kit

Viscosity for each paint mix

Mixing start time and mixing finish time (or mixing start time and duration) for each paint mix

Application start time and finish time for each coat

Start of cure, end of cure and cure temperature for each cure cycle. If curing is performed in an oven fitted with a recording system then traceability to the oven recording would be acceptable

Thermal Treatment (Pre-Process and Post Process)

Time

Temperature

Vacuum Cadmium & Aluminum IVD

Glow Discharge

Partial Pressure

Voltage

Amperage

Time

APPENDIX E – MINIMUM BUY-OFF STEPS

This Appendix identifies the process and inspection steps that can be combined into a single buy-off (see definitions section) when performed by the same person.

If a step(s) have been started by one person and finished by another person then each person must buy-off by applying a stamp or signature/initial sign-off and dated for the step(s) or portion of the step they have done, unless an alternative responsibility is clearly defined.

Thermal treatments at temperatures of greater than 250°F (121°C) require a separate buy-off.

If the sequence of steps contains more than one main process, e.g. conversion and paint, then each main process must have a buy-off.

Potential Process Steps	Buy-Off Requirement
Incoming inspection	Buy-Off Step
Pre-process cleaning method(s)	Buy-Off Step -These steps can be combined into a single buy-off unless otherwise required above.
Pre-coat thermal treatment (If greater than 250°F (121°C) this requires a separate buy-off).	
Masking	
Fixturing, racking	
Degrease / Alkaline Clean	
Rinse and Water Break Free Test	
Etch Clean / Deox / Activation	
Rinse and Water Break Free Test	
Strike / Prime	
Process: (e.g. Anodize, Conversion, Passivate, Electroplating, Painting, Etching).	
Drying	
Post-process cleaning methods	
Post-coating thermal treatment (If greater than 250°F (121°C) this requires a separate buy-off).	

Lot Inspection and Testing (e.g. Adhesion, Thickness, Visual).	Buy-Off Step -These inspections / tests can be combined into a single buy-off unless otherwise required above. Also see 5.7.1
Final Inspection	Buy-Off Step - These steps can be combined into a single buy-off unless otherwise required above.
Packaging	
Shipping	
NOTE: For manufacturing facilities, when final inspection, packaging and shipping operations are outside the scope of the CP audit, buy-off of these steps is not applicable.	

APPENDIX F - EXAMPLE SOLUTION MATRIX

The example Solution Matrix has been deleted from here and moved to the Chemical Process Audit Handbook.

APPENDIX G – TABLE 1, DEFAULT FREQUENCY FOR PERIODIC TESTING

1. **PURPOSE**

To define the default periodic test frequencies adopted by the Chemical Processing Task Group for periodic tests where the specification or purchaser does not specifically define them. Other test requirements (number of samples, size of samples, test parameters etc) shall be as defined in the specification; where these are not defined customer agreement, or Prime agreement, shall be obtained.

2. **SCOPE**

This document applies to National Specifications and Consensus Specifications flowed down in OEM contracts from Prime Companies requiring AC7108 Accreditation for that process - it does not apply to customer owned specifications.

An example situation where Table 1 applies is AMS2412 Rev G. AMS2412 states, “Composition (3.4.2), hydrogen embrittlement (3.4.4), and tests of cleaning and plating solutions (See 8.4) are periodic tests

and shall be performed at a frequency selected by the processor unless frequency of testing is specified by purchaser."

3. **GENERAL**

This Appendix does not contain any questions but does identify requirements that are to be applied to audits subject to AC7108 Accreditation.

4. **TIME INTERVAL DEFINITIONS**

Nadcap recognized time intervals and allowable extension beyond the due date invoked by OP 1105 and defined in OP 1103. If the applicable standard defines a timeframe or allowance, it shall take precedence.

Daily Test: Each day (the proces is done), no specific time. No allowable extensions.

Weekly Test: Within 7 calendar days with an allowable extension of 1 day.

Bi-Weekly: Within 14 calendar days with an allowable extension of 2 days.

Monthly Test: By the same date the next month. If the next month does not have the same date, it shall be by the last day of the next month (e.g. from March 31 to April 30). The allowable extension is 3 days.

Quarterly Test: By the same date, three months later. If the third month does not have the same date, it shall be by the last day of the third month (e.g. from March 31 to June 30). The allowable extension is 4 days.

Semi- Annual: By the same date, six months later. If the sixth month does not have the same date, it shall be by the last day of the sixth month (e.g. from March 31 to September 30). The allowable extension is 6 days.

Annual: By the same date of the next year. One year from February 29 shall be February 28 of the next year. The allowable extension is 12 days.

5. **TABLE 1**

Table 1 Defines the default frequency requirements.

Periodic Test	**AC7108/4 App B Designation**	**Frequency**
Adhesion Test – Paints	B6, B10	Monthly

Adhesion Test – Metallic Coatings	B7, B8, B10, B11, B12, B18, B19	Monthly
Hydrogen Embrittlement	B2	Monthly
Hydrogen Pick-Up		Monthly
IGA/EGP	B3	Monthly
Micro Hardness	B4	Monthly
Corrosion Testing for Protective Coatings (e.g. electroplate, anodize, chromate)	B5, B6	Monthly
Testing for Passivated Surface	B5, B6	Weekly
Erosion or Wear Testing	B9	Monthly
Coating Weight Testing	B13	Monthly
Resistivity Testing	B15	NA - no known periodic test requirement for chemical processing.
Thickness	B16	NA - no known periodic test requirement for chemical processing.
Solderability	B17	NA - no known periodic test requirement for chemical processing.
Porosity Testing	B20	Monthly
Composition – Alloy Plate including Electroless Nickel and Gold.		Monthly
Composition – Pure Plate (e.g. Silver)		Quarterly