Special Processes Institute



SPECIAL PROCESSES GUIDEBOOK



SPI-01
Revision 7
25 Sep 2026

sp-i.org

Special Processes Guidebook

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1. Introduction

1.1. Purpose

The purpose of this guide is to improve awareness, understanding and effective management of special processes. The most current version of this document is maintained online at https://sp-i.org and should be considered the authoritative source. This guide is provided for open use and may be reproduced or excerpted, in whole or in part, without restriction.

1.2. Scope

This document defines special processes relevant to the aerospace, space, and defence sectors, as well as other high-performance and safety-critical industries including, but not limited to, automotive, nuclear, medical device manufacturing and advanced electronics. These processes are typically dependent on operator competence, specialised equipment and/or tightly controlled environments. As the conformity of the resulting output cannot be fully verified by subsequent inspection or testing, assurance is achieved through robust process definition, validation and ongoing control.

2. Quality Requirements

2.1. ISO9000 Fundamentals and Vocabulary

In accordance with ISO9000:2015(E) 3.4.1 Process. Note 5: A process where the conformity of the resulting output cannot be readily or economically validated is frequently referred to as a “special process”.

2.2. ISO9001 Requirements

Special Processes are reference in ISO9001 8.5.1 f “the validation, and periodic revalidation, of the ability to achieve planned results of the processes for production and service provision, where the resulting output cannot be verified by subsequent monitoring or measurement”

2.3. AS9100 Requirements for Aviation, Space and Defence

Specific requirements are listed in AS9100 8.5.1.2 Validation and Control of Special Processes as; For processes where the resulting output cannot be verified by subsequent monitoring or measurement, the organization shall establish arrangements for these processes including, as applicable:

a. definition of criteria for the review and approval of the processes.
b. determination of conditions to maintain the approval.
c. approval of facilities and equipment.
d. qualification of persons.
e. use of specific methods and procedures for implementation and
f. requirements for documented information to be retained.

2.4. Requirement Summary

A special process is one in which the conformity of the resulting product or a service applied to that product cannot be fully verified by subsequent non-destructive inspection or measurement. Because compliance with requirements cannot be assured through calibrated measurement or routine inspection alone, such processes must be validated. Validation is achieved by demonstrating that the process, when operated under defined and controlled conditions, is capable of consistently producing outputs that meet specified requirements. This is typically confirmed through the processing of representative test samples followed by destructive or otherwise definitive testing.

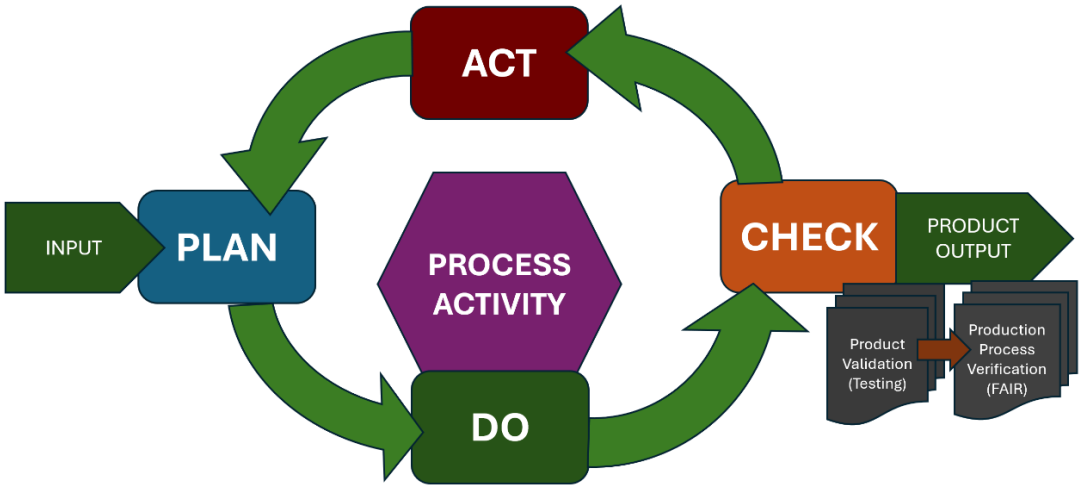
3. Production Process Verification

3.1. Verifiable (Standard) Process

To further understand, an output of a process that can be verified is usually done during the production process verification or inspection. For example, where a machined part is manufactured to design data that includes dimensional tolerances is inspected. In this case, the output can be verified or tested (validated) by the use of a calibrated tool or measuring instrumentation. The ‘inspection’ or production process verification activity ensures the production process is able to produce product that meet requirements. This activity can be referred to as first article inspection. In other words, the product (output) inspection or test can verify the process.

3.2. Process Verification by Product Validation PDCA Cycle

The below Plan Do Check Act diagram demonstrates typically how process output (product) is validated which directly verifies the process is sufficient to produce consistent and conforming output.



4. Special Process Validation

4.1. Process Control

Special processes require a different approach to control. Instead of the output being directly measured for conformity, the process itself is 'measured' (validated). This validation process takes the form of periodic testing and qualification of the process and / or operators performing the process against criteria detailed in specifications.

One or more of the following activities are used to validate a special process: -

- Test pieces processed and destructively tested and results evaluated on a periodic basis
- Qualified Operators are periodically evaluated or re-qualified
- Periodic monitoring, testing and system accuracy tests are performed on the process, equipment and measurement instrumentation.

4.2. Periodic Testing (Re-Validation)

All special processes must be validated and re-validated (periodically tested) to verify that the process is capable of producing product that repeatedly meets requirements. Usually, validation consists of processing a test piece or test standard made of the same material with known properties through the special process and then destructively testing the test piece. For example, for surface treatment such as chemical conversion coating, electroplating, anodising or application of paint the validation includes the periodic adhesion testing and salt spray (corrosion) testing of test coupons that are processed on a monthly or batch basis etc.

4.3. Qualification

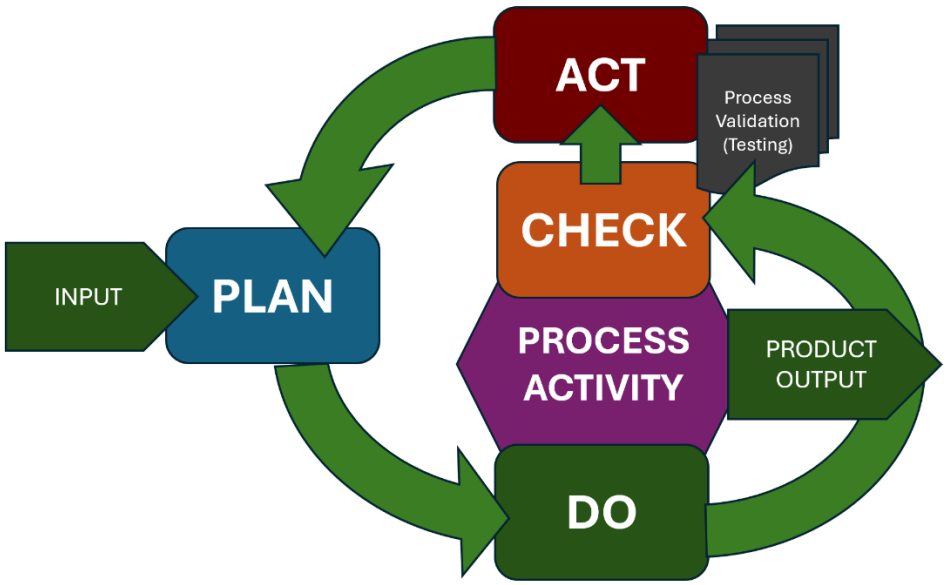
Some special processes require processing staff to be formally qualified and periodically re-qualified as part of the validation process. For Example, coded welder and weld inspection, Non-destructive Testing (NDT) Level II & III qualification etc. SAE AS7767 establishes the minimum requirements for qualifying personnel who perform, supervise, inspect or approve special processes, ensuring they have the knowledge, skills, training and ongoing competence necessary to consistently produce conforming products. This is discussed further in the human factors section of this guidebook.

4.4. Monitoring & System Accuracy Testing

Some special processes require periodic monitoring of the system accuracy. For example, heat treatment system accuracy test and temperature uniformity survey (AMS2750 Pyrometry SAT & TUS) or NDT penetrant flaw detect TAM panel processing and evaluation to verify the NDT system is functioning correctly etc.

4.5. Product Verification by Process Validation PDCA Cycle

The below Plan Do Check Act diagram demonstrates typically how product (output) is verified by process validation and revalidation (periodic testing).



5. Process Risks and Failure Modes

If special processes are not validated or periodically tested (re-validated) then, as a consequence, deficiencies can become apparent only after the product is in use or the service has been delivered. For example, where parts are coated (plated or painted), lack of process control can result in poor adhesion and the coating may crack, blister, flake or peel after delivery or in service etc. See the appendix at the end of this document.

5.1. Process Failure Mode Effect Analysis (PFMEA)

All processes including special processes can benefit from a failure mode effect analysis activity to anticipate risks and the output of the PFMEA should input into process control documentation. For further guidance see AS13004 Process Failure Mode and Effects Analysis and Control Plans.

5.2. Process Control Three Tiers of Failure

Process control failures typically fall into three distinct tiers: Intent, Implementation and Effectiveness. Understanding and addressing each of these is critical to maintaining product conformity.

5.2.1. Intent

This failure occurs when there is no deliberate effort to validate the process, often stemming from a lack of awareness, misunderstanding of requirements, or a belief that validation is unnecessary or too costly.

5.2.1.1. Common Causes

- Misinterpretation of specifications, standards or customer requirements.
- Overconfidence in legacy processes or anecdotal evidence (“we’ve always done it this way”).
- Underestimating the risks associated with unvalidated processes.
- Budget constraints or time pressures leading to a de-prioritisation of validation activities.

5.2.1.2. Typical Consequences

- Uncontrolled variation in process output.
- Undetected nonconformities.
- Increased risk of field failures or customer returns.

5.2.1.3. Best Practices to Address Intent Failures

- Clear documentation for special processes. Refer to the special process documented information in this publication.
- Training leadership and technical staff on validation requirements.
- Embedding process validation into the product lifecycle and risk assessment activities.

5.2.2. Implementation

Here, the organisation understands the need for process validation and intends to comply but fails to effectively implement validation or training due to resource gaps, poor planning or weak procedural controls.

5.2.2.1. Common Causes:

- Incomplete or generic validation plans that don't reflect actual process conditions.
- Lack of skilled personnel to develop or execute validation protocols.
- Poor coordination between engineering, quality and production teams.
- Inadequate training on new or revised processes.

5.2.2.2. Typical Consequences:

- Inconsistent validation results.
- Nonstandard process execution during production.
- Difficulty proving conformity during audits.

5.2.2.3. Best Practices to Address Implementation Failures:

- Develop detailed, process-specific validation protocols including measurable criteria.
- Appoint process owners with appropriate knowledge and understanding of the requirements for special processes.
- Use cross-functional teams for validation planning and execution.
- Ensure documentation includes all critical inputs, environmental conditions and equipment parameters.
- Train operators and quality inspectors before process release.

5.2.3. Effectiveness

The special process is validated through defined controlled conditions, but the process is not always followed correctly during normal production.

5.2.3.1. Common Causes:

- Operator workarounds or informal "tribal knowledge."
- Inadequate control over key variables (e.g., temperature, time, pressure).
- Poor maintenance of validated equipment.
- Failure to perform periodic revalidation or process audits.

5.2.3.2. Typical Consequences:

- Reduced process capability over time.
- Nonconformances that pass undetected due to reliance on invalid process assumptions.
- Customer escapes or audit findings due to lack of adherence to validated conditions.

5.2.3.3. Best Practices to Address Effectiveness Failures:

- Enforce process discipline through standard work instructions and job aids.
- Use statistical process control (SPC) to monitor critical parameters.
- Conduct periodic internal audits focused on special processes.
- Schedule and document revalidation activities, especially after process changes.

5.3. Reducing Risk by Auditing Special Processes

Both internal and externally sourced special processes must be subject to regular audits to obtain objective evidence that process validation is fully compliant with applicable specifications and standards. These audits are essential to verify that processes are executed correctly and that the final outputs consistently meet all quality requirements.

5.3.1. Checklists

To ensure thorough and consistent evaluations, audit checklists should be directly derived from the relevant specifications or standards, providing a structured framework for assessment. This systematic approach enables auditors to verify each process element and confirm adherence to all validation procedures. Regular surveillance audits also serve to identify potential nonconformities or opportunities for improvement, facilitating timely corrective actions that uphold process integrity and product quality.

5.3.2. Distinguishing Audits from Validation Requirements

While surveillance audits and quality verification activities are critical for ongoing compliance monitoring, they must not replace the formal validation and revalidation activities mandated by the applicable standards or specifications.

5.4. Human Factors

The greatest threat to process integrity is rarely deliberate negligence. More often, it arises from the natural human tendency to simplify tasks, eliminate perceived unnecessary steps or shorten process times in an effort to improve efficiency and meet production or delivery demands. Without a sound understanding of the science behind the process, these well-intentioned shortcuts can have unintended consequences that remain hidden until the product fails in service. Humans naturally seek the easiest path to complete a task.

5.4.1. The Importance of Technical Knowledge

When production pressures increase, experienced operators frequently develop what they believe are harmless shortcuts:

"I've done this hundreds of times."
"It always works."
"Five minutes won't matter."
"That's rinsed enough."
"That's a close enough time and temperature."
"It looks and feels okay. "

Most of these decisions are made with the best of intentions to improve efficiency or avoid unnecessary delays. Unfortunately, special processes are governed by chemistry, metallurgy and physics rather than appearance. Small deviations that appear insignificant may fundamentally change the properties of the finished product. Without sufficient technical knowledge, personnel cannot appreciate the hidden purpose behind each process requirement and therefore cannot accurately judge which steps are critical.

5.4.1.1. Why Technical Knowledge Matters

Technical knowledge allows personnel to understand:

- why specifications contain precise requirements
- why process parameters have acceptable limits
- what failure mechanisms are being prevented
- how small process variations accumulate
- why customer requirements sometimes exceed commercial practice
- why every process must be carried out consistently

Knowledge transforms operators from people who simply follow instructions into professionals capable of recognising risks before defects occur.

5.4.2. Science Behind the Process

Without understanding the science behind the process, personnel naturally substitute experience for technical knowledge. This often leads to the belief that process parameters are merely recommendations rather than carefully established limits developed through years of research, testing and service experience.

5.4.3. SAE AS7767 Qualification of Personnel Performing Special Processes

AS7767 addresses this risk by requiring organisations to define Bodies of Knowledge, qualify personnel through theoretical and practical examinations and periodically reassess competence. The objective is not simply to ensure people can perform a task, but to ensure they understand the consequences of deviating from approved procedures.

5.4.4. Recognising the Risks

Special processes succeed because people understand the science behind the specification, not because they memorise the procedure. Every process parameter exists for a technical reason. When that reason is understood, shortcuts become recognised as risks rather than improvements. Technical knowledge is therefore one of the most effective defences against the human factors that lead to latent defects, in-service failures and compromised safety.

6. Defined Special Processes for Aerospace, Space, Defence and Reliability-Critical Sectors

6.1. Special Processes Reference Table

The below table contains special process categories and specific processes within each category. Each of the below specific processes will have or produce one or more characteristic that can only be tested or verified by destructive methods.

Special Processes Incorporated in Manufacturing		
Welding	**Chemical Processing**	**Electronics**
Rotational Friction / Inertia Welding, Torch / Induction Brazing, Flash Welding & Laser Welding, Electron Beam Welding, Resistance Welding, Fusion Welding & Evaluation of Welds	Electroplating, Electroforming, Electroless Plating, Anodising, Chemical Conversion Coatings, Passivation, Painting & Dry-Film, Surface Enhancement, Etching & Chemical Cleaning, Surface Treatment Engineering	Printed Circuit Board (PCB) Manufacture, PCB Assembly (Incl. Soldering), Cable and Harness Assemblies, Conformal Coating, Battery Cell Manufacture & Array Assemblies
Composites	**Elastomer Seals**	**Heat Treatment**
Prepreg, Adhesive Bonding, Resin Film Infusion, Metal Bonding, Core Processing, Liquid Resin & Compression Moulding	Plate Seals, Fabric / Textile Reinforced Seals, O-Rings & Moulded Shapes	Brazing (including dip brazing), Metal Heat Treating, Carburizing, Nitriding, Hot Isostatic Pressing, Induction Hardening & Sintering
Materials Testing & Inspection	**Nonconventional Machining**	**Non-destructive Testing**
Chemical Analysis, Mechanical Testing, Metallography, Micro Indentation Hardness Testing, Corrosion Testing, Fastener Testing, Physical Testing & Thermal Testing	Electrochemical Machining, Electrochemical Grinding, Electrical Discharge Machining, Laser Beam Machining, Laser Part Marking & Spark Erosion Grinding	Penetrant Flaw Detect, Anodise Flaw Detect, Magnetic Particle Inspection, Ultrasonic Testing, Radiographic Inspection Testing & Eddy Current Inspection Testing
Additive Manufacturing		
Directed Energy Deposition (DED)	Powder Bed Fusion (PBF)	Sheet Lamination (SHL)
Laser Engineered Net Shaping (LENS), Electron Beam Additive Manufacturing (EBAM), Wire Arc Additive Manufacturing (WAAM)	Selective laser sintering (SLS), Selective laser melting (SLM), Direct metal laser sintering (DMLS), Electron beam melting (EBM), Selective heat sintering (SHS) & High-speed sintering (HSS)	Laminated object manufacturing (LOM), Selective lamination composite object manufacturing (SLCOM), Plastic sheet lamination (PSL), Selective deposition lamination (SDL)
Material Extrusion (MEX)	Material Jetting (MJT) & Binder Jetting (BJT)	Vat Photopolymerization (VPP)
Fused deposition modelling (FDM) & Fused filament fabrication (FFF)	PolyJet, Nanoparticle jetting (NPJ), Drop on demand (DOD)	Stereolithography (SLA), Digital light processing (DLP) & Continuous digital light processing (CLIP)

6.2. Standards & Specifications

All special processes have a related standard or specification that defines the validation method, frequency and criteria to be applied. For example, see the below table of standards and specifications relating to special processes. Please note that this list is not comprehensive.

Examples of Special Process Standards & Specifications		
Welding	**Chemical Processing**	**Electronics**
ISO 24394, Def Stan 03-34, Def Stan 08-39, ISO 10042, ISO 3834, ISO 2553, AWS D17, AWS B5.2	MIL-PRF-8625, MIL-DTL-5541, AMS 2700, AMS-QQ-N-290, ASTM B545, ISO 2081, ISO 4042, AMS 03-11, AMS 2454, Def Stan 03-32	IPC J-STD-001, IPC-A-600, IPC-A-610, IPC-A-620, IPC-A-630, IPC-CC-830
Composites	**Elastomer Seals**	**Heat Treatment**
ASTM E2981, ASTM D6856 ASTM D7745, AMS 3914, AMS 6885, AMS 3961, ISO 21368	ISO 27996, AS4716, AS3569	AMS 2750, AMS 2759, AMS 2769, AMS 2770, AMS 2771, AMS 2772, AMS 2773, AWS A5.31, AWS C3.7, ISO 13585
Materials Testing & Inspection	**Nonconventional Machining**	**Non-destructive Testing**
ISO 22826, ASTM E103, ASTM E1842, ISO 6892, ASTM E1004, AMS2658, ASTM B-117, ISO 15530-3, ASME B89, ISO 898-1, ISO 3506-1, ASTM F606	AMS2548, ASTM DL MNL56, VDI 3400, BS 2634-2	ASTM E1417, ISO 3452, ISO 5579, EN 4179, ISO 9712, ISO TS 11774, ASTM E3166, ASTM E165, ASTM E1209, ASTM E709
Additive Manufacturing		
DNV-CG-0197, ISO/ASTM 52904, ASTM 52927, ISO 17295, ASTM 52950, ASTM 52919, ASTM 52930, ASTM 52910, ASTM 52900, ASTM F3635, AWS D20.1, ASTM DL STP1631, NACE AMPP TR21522, ASTM F3554, AMS7005, ASTM F3413		

6.3. External Sources of Special Processes

When outsourcing special processes to external providers, it is imperative to include the applicable standards or specifications within the design documentation or purchase order. This must clearly detail the requirements for process control, validation methods and any additional criteria necessary to ensure the process consistently meets established quality requirements.

7. Associations, Groups, Programmes and Institutions

7.1. Key Organisations Supporting Special Processes

There are numerous professional bodies, industry groups, programmes and institutions that play a vital role in supporting specific special processes. These organisations offer professional memberships, technical guidance, training, certification and qualification programmes to promote industry standards and best practices.

7.2. Organisation List

Below is a selection of some of the most widely recognised and respected organisations in their field.

7.2.1. Automotive Industry Action Group (AIAG)

AIAG is the global automotive industry's collaborative hub — uniting OEMs, suppliers and service providers to create best-in-class processes for quality, supply chain and sustainability.

7.2.2. European Society for Composite Materials (ESCM)

The ESCM is a non-profit, non-governmental scientific and engineering association bringing together people from all over Europe with recognized expertise and contributions in composite materials. ESCM members share common goals to advance knowledge and innovation in this field.

7.2.3. Institute of Electronics (IE)

The IE is one of the oldest Institutions in the UK, specifically for electronic engineers. Formed in 1930 and incorporated in 1935 the Institution has a long history of excellence in the field of electronics.

7.2.4. Institute of Materials Finishing (IMF)

The IMF was established in 1925 as the Electroplaters and Depositors Technical Society to share technical knowledge on electrodeposition through publications, meetings, and conferences. Renamed the Institute of Metal Finishing in 1951, its focus expanded to all metal surface finishing. In 2013, it became the Institute of Materials Finishing to reflect its broader scope, including electroplating, painting, anodising, printed circuitry, and related treatments. More recently, the IMF has further extended its interest to encompass wider aspects of surface engineering.

7.2.5. Institute of Materials, Minerals & Mining (IOM3)

The IOM3 Elastomer Group, formerly known as the Rubber In Engineering Group (RIEG), organises regular webinars, technical discussion meetings and conferences to develop a broader understanding of the behaviour of elastomers and elastomer composites.

7.2.6. The British Institute of Non-Destructive Testing (BINDT)

The aim of BINDT is to promote the advancement of the science and practice of non-destructive testing (NDT), condition monitoring (CM), diagnostic engineering and all other materials and quality testing disciplines

7.2.7. Nadcap

The Nadcap programme is an industry-led conformity assessment initiative that unites technical experts from the aviation, defence and space sectors to establish special process accreditation requirements, accredit suppliers and define operational standards.

7.2.8. Metal Treatment Institute (MTI)

As the largest network of heat treaters in the world, MTI strives to fulfil its mission of enhancing the image and profitability of the heat-treating industry.

7.2.9. The Welding Institute (TWI)

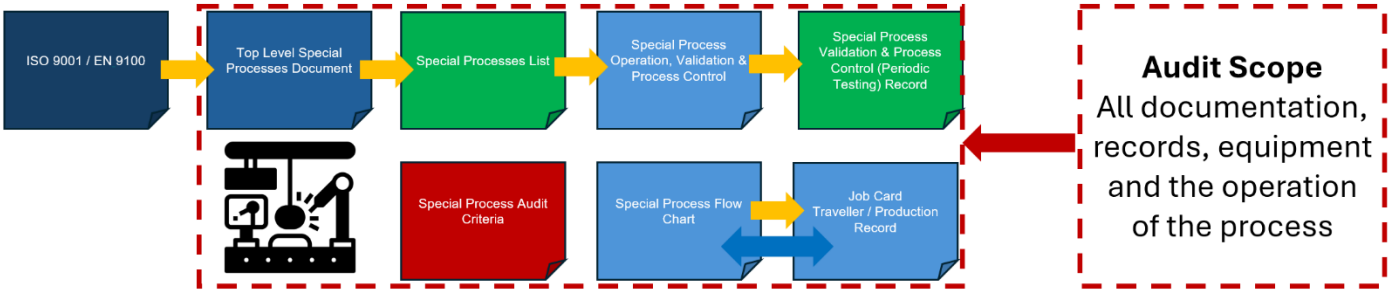
TWI is the leading engineering institution supporting welding and joining professionals with welding, joining and allied technologies.

8. Special Processes Documented Information

The following regarding documented information is provided solely as guidance and is intended to illustrate examples of good practice. It is not mandatory and should be adapted as appropriate to suit the specific needs and context of the organisation.

8.1. Document Hierarchy

To ensure effective process control in accordance with EN9100 clause 8.5.1.2, documentation should follow established best practices and include key components detailed in the sections below.



8.2. Top-Level Special Processes Document

The top-level Special Processes document outlines the overarching framework, responsibilities and requirements for process control across the organisation. It should also include references to the following supporting documents.

8.3. Special Process List / Library

A centralised and controlled register should be maintained to identify all special processes conducted within the organisation. This register may be created as an Excel spreadsheet and stored on a shared platform such as SharePoint, or an equivalent system, to ensure accessibility and version control. Alternatively, the special process register may be incorporated into the top-level Special Process Operation, Validation & Process Control document, rather than maintained as a standalone file.

The register should include, at a minimum, the following columns: -

List Item	Description
Reference number	Sequential numbering with leading zeros (001) that identifies document series E.g. SP3-001
Process name	Name of the special process E.g. Chemical Conversion Coating
Category	Category of the special process E.g. Chemical Processing
Location	Physical location of the process
Process owner	Named person that is responsible for the process and controls
Process SME	Named person that is the process subject matter expert (Can be same as owner or operator)
Special Process Operation, Validation & Process Control Document	SP3 document reference E.g. SP3-001
Programme(s)	Business area / programme / project that uses the process
Status	Under Development – In the process of being written or revised. Pending Approval – Awaiting sign-off. Active – In use and current. This includes for production or trial / pilot use Inactive – Temporarily inactive but may resume. Decommissioned – Officially retired and no longer maintained.
Notes	Any notes or comments

8.4. Special Process Operation, Validation & Process Control Documentation

Each special process should be supported by a dedicated Special Process Operation, Validation & Process Control document. This document is intended to capture key information including the specific process control criteria and should include the following content: -

Content	Description
Document number	Document reference that is listed in the special process list
Title	Name of the special process and “Operation, Validation & Process Control Documentation”
Associated Documents	List of documents E.g. Top-Level Special Processes Document, special processes list, specifications and standards including national, international and customer
Intent Description	Overview of the special process including process intent E.g. To coat aluminium alloy articles with a corrosion resistant coating
Established Process Capabilities and Limitations	Overview of the process capability and limitations E.g. Size and weight limitations. Should include PFMEA (Process Failure Mode and Effect Analysis) output
Definition of criteria	This shall be the extraction of process controls, validation and revalidation criteria in a 'Table 1 Matrix' See below table
Approval of facilities and equipment & Determination of conditions to maintain the approval.	Description of the approved facilities (E.g. Temperature and humidity controls) and approved equipment list including consumables and calibration requirements
Qualification of persons.	Description of the training and qualification required to operate the process. Can include training matrix references
Requirements for documented information to be retained	Reference to Special Process Validation & Process Control (Periodic Testing) Record
Process Operation	Description of how the process is operated and / or reference to Special Process Flow Chart
Process control and validation / revalidation methods	This shall include methods or reference to methods used to maintain approval E.g. Chemical Analysis methods and / or external ISO17025 test laboratories used.

8.5. Table 1 Matrix

This information may be included as an annex to the Special Process Operation, Validation & Process Control document, or alternatively, it can be provided as a reference to a spreadsheet stored on a shared platform such as SharePoint or a similar system. The table or matrix does not need to be titled "Table 1 Matrix" and may be named as appropriate to suit the organisation's conventions.

Table Item	Description
Process Operation	What element is being tested. E.g. Cleaner temperature
Control Specification	National / International specification or standard and customer process specification reference
Process control test / inspection / validation	Test to conduct
Type	Type of control E.g. Inspection, validation process control
Frequency	Frequency E.g. Weekly, monthly or per batch / shift
Test coupons	Description of test coupons E.g. size, material and quantity
Acceptance criteria	Test acceptance criteria E.g. 50-60°C include specification range and 'target' range if applicable E.g. 52-58°C
Test by	Qualification of person or external laboratory

8.6. Process Control & Validation Records

Maintain complete and traceable records of process control activities, including routine monitoring and periodic (e.g., destructive) testing results.

Table Item	Description
Test No.	Reference number of the test if applicable
Sample date	Date / time of sample
Test date	Date / time of test
Document Reference	Job card / works order reference if applicable
Process Operation	What element is being tested. E.g. Cleaner temperature
Control Specification	National / International specification or standard and customer process specification reference
Process control test / inspection / validation	Test to conduct
Type	Type of control E.g. Inspection, validation process control
Frequency	Frequency E.g. Weekly, monthly or per batch / shift
Test coupons	Description of test coupons E.g. size, material and quantity
Acceptance criteria	Test acceptance criteria E.g. 50-60°C include specification range and 'target' range if applicable E.g. 52-58°C
Test equipment	Equipment used for test including calibration information
Test results	Result of the test
Test laboratory test report	Reference to and / or link to test laboratory test report or certificate if applicable
Status	Pass / Fail / Test Error - Clear indication of status
Test Data	Reference or link to test data such and electronic data, photos etc. (if applicable)
Notes	Any supporting information or observations E.g. Retest, action taken, additions, adjustments, corrections.
Test by	Person conducting the test
Reviewed by	Person reviewing / signing off test (if required)

8.7. Process Flowcharts and Job Cards

Each special process should be supported by a clear and easy-to-understand visual process flowchart. This flowchart should outline the key stages of the process, including critical control points, verification steps and any required approvals. Its purpose is to aid in standardisation, operator understanding and consistent execution of the process. The flowchart may be embedded directly within job cards or travellers, or maintained as a standalone document referenced within relevant operational documentation. The chosen format should ensure accessibility to all relevant personnel at the point of use and support effective process control. The following items should be included: -

Item	Description
Op No	Operation Number - Sequence number
Process step	Name of the process step
Instruction	Specific instruction relating to the process stage
Control characteristic	Any control characteristic E.g. Time, temp, power setting, critical control characteristics and inspection / test or verification criteria
Record to be maintained	Verification, test or inspection results of control characteristics
Sign off or stamp	Sign off operation step as complete if applicable

8.8. Audit Criteria Checklist

A clearly defined checklist should be developed for each special process to support both internal and external audits. This checklist serves as a practical tool to verify that all process validation, control measures and documented requirements are being consistently followed. It should cover key elements such as operator qualifications, equipment calibration and maintenance, adherence to approved procedures, record-keeping and the effectiveness of process controls. Checklists should be reviewed periodically and updated as

necessary to reflect changes in standards, customer requirements, or internal procedures. The following items should be considered to be included into a check list: -

Audit Item	Description
Audit Title	Name of the audit
Audit Team Members	Names and roles of auditors conducting the audit
Auditee(s) / Contact Persons	Individuals being audited or responsible for the area/process being assessed
Date and Time	When the audit is scheduled or conducted
Location	Physical or virtual site being audited
Serial	Reference number of criteria
Element	Type of audited item: Documentation, equipment, process etc.
Clause/Reference	Reference to applicable standard or internal procedure
Audit Question or Requirement	Specific audit question or requirement being assessed
Evidence Required	Type of evidence to be gathered (e.g., documents, records, observations)
Conformity Status	Evaluation of compliance: Conforms, Yes, No or N/A
Objective Evidence Found	Notes on what was seen, heard, or reviewed that supports the conformity status
Comments or Observations	Additional remarks, context, or explanations

8.8.1. Audit Report

An audit report serves as the formal output of an audit activity, providing a structured and objective assessment of the process against the checklist. The following elements are recommended for inclusion in an audit report: -

Audit Item	Description
Audit Overview	Includes the audit title, objectives, date(s), auditors involved, and scope of the audit.
Process Audited	Details of the specific process reviewed, including location, process owner and related documents.
Audit Criteria	Lists the standards, procedures and requirements used as the basis for the audit
Summary of Findings	High-level summary of the audit results, including number of nonconformities, areas of concern, and general compliance status.
Detailed Audit Findings	In-depth description of each observation or nonconformity, including references to criteria, supporting evidence and severity classification.
Recommendations and Best Practices	Suggestions for improvement and identification of good practices observed during the audit
Root Cause Corrective Action Plan	Agreed actions to address nonconformities, including responsible persons and deadlines.
Follow-Up and Verification	Plan for future audits or checks to confirm that corrective actions have been implemented and are effective.
Sign-Off and Distribution	Signatures of auditor(s) and process owner(s), along with the date of report issuance and distribution list.

9. Summary and Revision Control

9.1. Summary

In summary, this guidebook serves as a critical resource for understanding, implementing and maintaining special processes in industries where product quality and reliability are paramount. It provides a structured approach to process validation, control and documentation, ensuring consistent output and minimizing risks associated with special processes.

9.2. Further Information

Further information and resources can be found on the special processes institute website https://sp-i.org

9.3. Document Revision Control

Rev	Date	Change	Author
1	10 Sep 2016	Established the SPI special processes guidebook	Konrad Burgoyne
2	25 Jan 2018	Addition to the special processes table	Konrad Burgoyne
3	22 Nov 2020	Addition of process specification example table	Konrad Burgoyne
4	10 Jun 2022	Addition of special process documented information tables	Konrad Burgoyne
5	20 Dec 2025	Rebranding update to document	Konrad Burgoyne
6	4 Jul 2026	Addition of human factors and AS7767 Qualification of personnel performing special processes	Konrad Burgoyne
7	25 Sep 2026	SPI Branding change	Konrad Burgoyne

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