Supplier Product Approval Process (SPAP)

Document Number : MSC-SE-0001
Revision : G

EMD uses the Supplier Product Approval Process (SPAP) to document a supplier's compliance to EMD design specifications and process capability to consistently meet those requirements. The SPAP requirement is applicable to production and service parts and raw material purchased by EMD and is applied against the part number that appears on the associated PO. The Supplier is required to obtain SPAP Approval prior to delivery of the first shipment unless otherwise instructed by EMD Global Purchasing.

The process is also applicable to suppliers of EMD purchased production tooling.

Reasons for SPAP Submission:

SPAP submission is required for any one or more of the following conditions.

- New production or service part.
- Any change in the production process, production equipment, process controls, or manufacturing location.
- Part design change initiated by either EMD or supplier.
- Correction of a discrepancy on previously approved material.
- Use of material that is different than that used in a previously approved part.
- Tooling that is new, modified, refurbished or replaced, or, tooling that is transferred to other locations.
- Change in sub-supplier for parts or services.
- Parts that have not shipped to EMD for more than 4 years.

Submission Requirements

Refer to Table 1 below for default SPAP submission requirements for production or service parts based on EMD SPAP risk categorization guidelines.

Note that tooling SPAPs do not have a similar risk matrix. However, tooling providers should consult the applicable EMD Tooling Engineer (TE) to determine the criticality of the tooling which is typically tied to the criticality of that part that the tooling is used for.

Table 1: Default SPAP Submission Requirements:

EMD Default SPAP Submission Requirements by SPAP Risk Category			
SPAP Element	**High Risk**	**Medium Risk**	**Low Risk**
A. SPAP Warrant (Form: FRM-SE-0001)	Yes	No	No
B. Dimensional results with ballooned drawings	Yes	Yes	No
C. Engineering change documents if applicable (MCR, DCR)	Yes	Yes	No
D. Material test results	Yes	Yes	No
E. Performance test results, if applicable	Yes	Yes	No
F. Weld qualification records per AI1651.	For welded parts only.	For welded parts only.	No
G. Process flow diagram	Yes	No	No
H. Process FMEA:	No, unless either: PFMEA is specified in VTS, or, Special characteristics exist on the EMD drawing.	No	No
I. Process control plan	Yes	No	No
J. SPAP sample(s)	Yes	No	No
K. Certificate of compliance to finish requirements (if applicable)	Yes	Yes	No
L. Measurement system studies (R & R studies)	For special characteristics only.	No	No
M. Process capability studies (Cpk, Ppk)	For special characteristics only.	No.	No
N. Packaging instruction / images.	Yes	No	No

The EMD SQE or Tooling Engineer (TE) has the authority to revise the SPAP submission requirements based on the criticality / risk of the parts being submitted and, if applicable, the nature of the change(s) that trigger the need for SPAP approval. Such changes may be additions to the submission requirements or waivers to one or more of the default requirements.

The ETQ SPAP system includes a "Requirements" phase which serves to document and communicate the specific SPAP submission requirements, including any additions or waivers for a particular SPAP event.

In all cases, modified submission requirements must be provided by EMD in written or electronic form (e.g. information from the ETQ "Requirements" phase) to be considered valid. The supplier is still expected to complete any waived elements but does not need to submit those waived elements to EMD at time of SPAP. The supplier must maintain full records of the SPAP documentation, including any waived elements, in the supplier's internal files and shall furnish those records to EMD upon request.

Other General SPAP Requirements

The Supplier shall ensure that appropriate controls are applied to internal processes as well as to sub-suppliers to ensure the quality of their incoming and internal components and materials. Upon EMD request, the Supplier shall provide copies of those qualification records as part of the SPAP process.

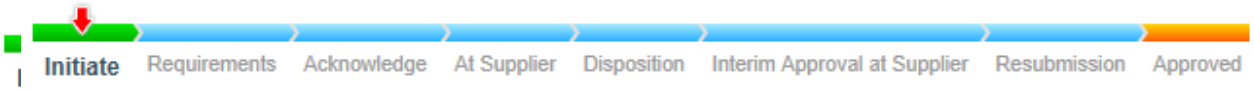
EMD reserves the right to conduct an SPAP review at the Supplier's site. EMD shall provide written notification of the intent for an on-site review.

Critical Fasteners listed in ETI 506 are never considered Commodity Parts. For more information, and to confirm if your fastener part number(s) are considered critical fasteners, please refer to ETI 506, "Quality Control of Critical Fasteners".

Contact your Buyer for a copy of the latest version of this document.

The ETQ SPAP Approval Process

EMD uses the online ETQ SPAP module to manage the SPAP process. This system processes SPAP's via the following SPAP workflow phases.



This workflow has the following phases:

1. "Initiate" (Owner: EMD – ETQ Administrator)

This step is the initial trigger step. The EMD ETQ administrator will review the initially triggered SPAP record and confirm that it is a valid SPAP event.

- If an SPAP is required, then the SPAP record is assigned to the SQE and pushed to the "Requirements" phase.
- If an SPAP is not required, then the SPAP record is cancelled and will not progress any further.

2. "Requirements" (Owner: EMD – SQE)

At this phase, the assigned SQE or TE checks off submission checklist items to indicate which submission content / documentation will be required in order to obtain SPAP approval. Once defined, the SPAP is moved to the "At Supplier" phase.

3. "Acknowledge" (Owner: Assigned Supplier)

At this phase, the supplier reviews the specified SPAP requirements established by the EMD SQE / TE in the previous phase and acknowledges the SPAP expectations. Once acknowledged, the supplier moves the SPAP to the "At Supplier" phase.

If the supplier has concerns with the specified SPAP requirements, the supplier is expected to:

- Select the "No" value in the "Acknowledgement of SPAP Requirements" section,
- Add a comment to the SPAP indicating the details of their concern,
- Move the SPAP back to the Requirements phase, and,
- Resolve their concerns with the assigned SQE / TE.

4. "At Supplier" (Owner: Assigned Supplier)

At this phase, the supplier uploads the necessary documentation per the submission checklist. When the supplier uploads all required documentation, the supplier pushes the SPAP into the "Disposition" phase.

The supplier is expected to obtain approval from EMD for any deviation or permanent change to EMD engineering specifications prior to submission. This approval can be requested by electronically initiating a Supplier Deviation request from the ETQ Deviation system. From the "Help Documents" view within the Deviation system itself, you can access additional information on the system's use.

It is expected that all non-conformances to EMD specifications are approved through the DA process prior to submission of the SPAP and that copies of all approved DA's are included in the submitted SPAP documentation.

5. "Disposition" (Owner: EMD – SQE)

At this phase, the EMD SQE / TE reviews the submitted information package and assigns an SPAP approval status as either:

Interim Approval:

The SPAP is approved and parts are approved for shipment, but some conditions apply (eg. Quantity restriction, time restriction, fit / form / function trials required, etc.). The specific approval conditions are documented in the SPAP record.

The SQE pushes the SPAP record forward to the "Interim Approval At Supplier" phase where the conditions for SPAP approval are to be resolved and missing information re-submitted.

The Supplier and SQE jointly work to resolve outstanding issues.

Full Approval

The SPAP is approved fully and parts are approved for shipment with no quality related restrictions. The supplier must still meet PO delivery requirements for both delivery date and quantity.

The SQE pushes the SPAP to the "Approved" phase which completes the SPAP approval process.

Rejected:

The SPAP is rejected and the supplier is not authorized to ship parts until outstanding issues are resolved and a subsequent interim or full approval is granted.

The EMD SQE pushes the ETQ SPAP record back to the "At Supplier" phase so that the SPAP issues can be resolved. The Supplier and the SQE work to resolve the issues.

6. "Interim Approval at Supplier" (Owner: Assigned Supplier)

At this phase, the supplier is approved to ship parts provided they remain compliant with the established conditions that were documented for the interim approval. The supplier is expected to resolve any outstanding issues and upload the necessary documents to clear the outstanding conditions for full approval.

Once all outstanding documentation has been uploaded by the supplier, the supplier pushes the SPAP record to the "Resubmission" phase.

7. "Resubmission" (Owner: EMD SQE)

At this phase (similar to the "Disposition" phase), the EMD SQE / TE reviews the submitted information package and determines SPAP approval status as either:

- Interim Approval:
- Full Approval
- Rejected:

See the "Disposition" phase for more details on the approval status codes and the resulting lifecycle phase to which the SPAP is moved.

8. "Approved" (Owner: EMD – SQE):

This is the final phase which simply indicates that the SPAP is approved.

SPAP Submission Elements

The following section identifies the key requirements for individual SPAP submission elements. There may be additional elements beyond those described in this section. Consult your assigned SQE or TE for any clarification that you need.

NOTE: For tooling SPAPs, the following items are typically not required unless specifically requested by the assigned TE:

- Process flow diagram
- Process FMEA
- Process control plan
- Weld qualification records
- Process capability studies
- Measurement system studies
- Appearance approval
- Packaging instructions

The Supplier shall comply with these requirements when the individual SPAP element is included as part of the required overall SPAP submission content. Failure to comply with any of the requirements may result in rejection of the SPAP submission.

A. **SPAP Warrant –** When requested, the Supplier must submit one SPAP Warrant per part number unless otherwise instructed by the EMD SQE. The SPAP Warrant shall be complete, legible and accurate. The SPAP will not be accepted if the warrant contains errors or is incomplete.

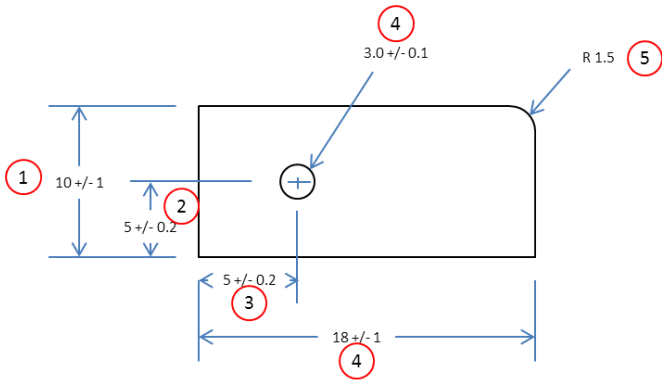
Reference document number FRM-SE-0001, "SPAP Warrant" on the EMD website for a blank version of the warrant form.

B. **Dimensional Results with Ballooned Drawings –** For each part number for which dimensional results are provided in the SPAP, there must be an accompanying ballooned design record (typically a drawing) submitted.

The ballooned drawing indicates which dimensions, specifications, notes etc. have accompanying data submitted. The expectation is that all dimensions, specifications, notes, etc. are included in the submission unless waived as part of the SPAP requirements provided to the Supplier by EMD.

Each measured or evaluated feature or specification shall have an associated identification balloon. The balloon is a circle with a unique id number inside.

See example illustration of a ballooned drawing section below:



See section D for detailed requirements on the dimensional results portion.

C. **Engineering Change Documents** – It is the supplier's responsibility to recognize when non-conformities exist as they work through the initial contract feasibility review, through planning and preparation of the SPAP and to take the appropriate corrective action to resolve any such non-conformities.

Temporary Change Requests:

If the supplier needs some short term relief for non-conformance to one or more of the requirements (dimension, material, performance specification, etc.) in order to meet EMD production delivery dates and to buy some time for the Supplier to implement the necessary corrective actions, the Supplier may request temporary deviation through a Supplier deviation request.

In this case, the Supplier shall initiate the Deviation request using the ETQ Deviation system. Once the Supplier has initiated the request and sent it to the "Assignment" phase, the system will route the request internally for EMD review, approval and release. Once the Deviation is dispositioned, the system forwards a status email to the Supplier contact indicating if it is approved or not. If approved, the Supplier shall include a reference to the approved DA number within the SPAP. If not approved, the Supplier must correct the non-conformance prior to SPAP submission.

You can look at the approval routing and current status of the Deviation request at any time from within the ETQ Deviation system.

There is no guarantee that the Deviation request will be approved, and if not approved, there may be a significant disruption to EMD's production schedule. Therefore, it is important to work diligently to prevent non-conformances in the first place. Tools to aid in the prevention of con-conformance may include process feasibility assessments at the quote stage, product and process design reviews including resolution of any tolerance, processing or other issues as early as possible, well in advance of the SPAP date.

Permanent Change Requests:

If the Supplier deems that all reasonable efforts to correct the part / process have been exhausted, and the non-conformity still cannot be resolved, then the Supplier may apply for permanent change approval using either a Design Change Request (DCR) or Manufacturing Change Request (MCR). These change requests should be initiated early in the process through your EMD Buyer, EMD Engineering or the assigned EMD SQE. EMD will internally route the request for EMD review, approval and release.

If the request is approved, then a copy of the approval (signed DCR or MCR) shall be provided to the Supplier who shall submit a copy of the approved document with the SPAP.

There is no guarantee that the change request will be approved, and if not approved, there may be a significant disruption to EMD's production schedule. Therefore, it is important to work diligently to prevent non-conformances in the first place. Tools to aid in the prevention of con-conformance may include process feasibility assessments at the quote stage, product and process design reviews including resolution of any tolerance, processing or other issues as early as possible, well in advance of the SPAP date.

D. **Inspection Results** – The supplier shall submit measurements for all dimensions, specifications, notes, etc., unless otherwise waived by the SQE / TE and inspection results shall be supplied for a minimum of 2 SPAP samples. For multiple process streams (e.g. multiple cavity tools, duplicate assembly lines, multiple cell manufacturing, etc.), two sample parts per process stream are required for inspection unless otherwise agreed.

For example, an SPAP for parts on a 2-up die would have dimensional results for 2 parts from cavity 1 and 2 parts from cavity 2 for a total of 4 SPAP sample parts.

The dimensional report shall include at a minimum, the following information.

- Balloon ID number (from the associated ballooned drawing) for each measured feature
- Specification / Requirement for each measured or evaluated feature
- Measured results for each required measured SPAP sample with identification of which sample the measurement applies to.
- Pass / Fail status for each measured feature
- The date of inspection
- The name of the person who executed the inspection(s)
- A conformance statement indicating whether the inspection results passed or failed to meet the acceptance criteria.

The sample parts should be the same part(s) that were inspected.

E. **Design Validation Test Results** – Where identified as part of the SPAP submission requirements, and where functional, performance, durability or reliability requirements are specified in the EMD specification (VTS, ETI, AI, EDPS, etc.), results shall be provided by the Supplier as evidence to indicate that the product design is capable of meeting such design requirements.

This element is 2-stage requirement.

First, the Supplier must provide both an initial completed copy of the "Engineering Approval for Functional Performance" form, as well as a full copy of the test results to EMD Engineering for review and approval.

The test results, at a minimum, shall include the following:

- List of planned validation tests including acceptance criteria
- The EMD part number and EMD Engineering revision levels for the tested parts
- Any deviation to the engineering specification that existed on the tested parts. These should be EMD Engineering approved in writing prior to conducting the testing to avoid any disqualified test results
- Quantity of parts tested
- The date of test completion

- Test results for each of the planned tests

- A conformance status statement indicating whether the test results passed or failed to meet the acceptance criteria
- A signature from an authorized supplier representative and date of signature

EMD Engineering shall review the submitted test information and resolve any discrepancies with the Supplier. Once the EMD Engineer is satisfied with the test results, they shall sign the "Engineering Approval for Functional Performance" form and return it to the supplier.

In stage 2, the Supplier shall submit a copy of the EMD approved "Engineering Approval of Functional Performance" form as well as the test results as part of the SPAP.

F. **Weld Qualification Records** – Where weld qualification is required, the supplier must submit with the SPAP evidence of compliance to EMD specifications. For specific details, please refer to AI 1651, "EMD Welding, Brazing and Soldering Specification".

For welding, this document defines the various requirements for weld procedure qualification, Weld Coordinator, Welder and Inspector qualifications, etc.

Contact your Buyer for a copy of the latest version of this document.

G. **Process Flow Diagram** – Unless otherwise waived by the SQE, the supplier shall provide a process flow diagram indicating the sequence of steps used to manufacture the product. The format of the process flow diagram is not specified by EMD; however, EMD has provided a Microsoft Excel template that may be used by the Supplier at their discretion. This template file, which includes templates for a process flow diagram, a process FMEA and a process control plan, can be found on the EMD web site.

H. **Process FMEA** – Unless otherwise waived by the SQE, the Supplier shall provide a Process Failure Mode and Effects Analysis (PFMEA) document. The file format of the PFMEA is not specified by EMD, however, EMD has provided a Microsoft Excel template that may be used by the Supplier at their discretion. This template file, which includes templates for a process flow diagram, a process FMEA and a process control plan, can be found on the EMD web site.

For more information on how to effectively develop an FMEA, you can order an AIAG FMEA Manual from the AIAG website.

I. **Process Control Plan** - Unless otherwise waived by the SQE, the Supplier shall provide a Process Control Plan document. The file format of the Control Plan is not specified by EMD; however, EMD has provided a Microsoft Excel template that may be used by the Supplier at their discretion. This template file, which includes templates for a process flow diagram, a process FMEA and a process control plan, can be found on the EMD web site.

For more information on how to effectively develop a Control Plan, you can order an AIAG Control Plan Manual from the AIAG website.

J. **Material and Performance Test Results** –

Material Tests:

The supplier must perform tests for all parts when chemical, physical, or metallurgical requirements are specified in the design specifications. This includes the requirements of the EMD Material Specification, heat treating and all EMD Engineering Test Instructions (ETIs) listed on the drawing or related specifications.

All castings and forgings must be tested in accordance with ETI 827 or ETI 930 respectively whether supplied to EMD in the rough, semi-finished or finished conditions. The supplier must indicate the drawing revision level of the parts tested, revision level of the specifications to which the part was tested and date on which testing took place. Any authorized engineering change documents (CR) that have not been yet incorporated in the design specifications must be indicated. All tests required should be listed in an understandable format along with the quantity tested and the actual results of each test.

Consult your Buyer for the latest copies of ETI 827 and ETI 930.

To avoid delays in approval, test samples for fulfilling the requirements of this section should be pre-submitted to:

Manager – EMD Materials Engineering Lab, Dept. 850,
9301 W. 55th Street,
McCook, IL 60525

Submitted samples are to include a copy of the SPAP Warrant. The supplier shall copy the applicable SQE or TE and Buyer on test samples sent directly to EMD Materials Engineering Lab.

The resulting EMD Materials Lab Report must then be submitted with the final SPAP submission.

K. **SPAP Samples** – SPAP samples shall be identified as such using tags, or where tags are not practical through labeling of the container or packaging. The identification shall include at a minimum,

- The SPAP ID number (obtained from the ETQ system)
- EMD Part number and EMD engineering revision
- Part description
- Supplier name, facility that is providing the SPAP and the city in which that facility is located
- PO number against which the first delivery of parts will be shipped
- The name of the EMD point of contact that is to receive the SPAP samples

While not a specific requirement, EMD has provided an SPAP Parts template label that can be attached to the part or part packaging that contains the above information fields.

Reference the SPAP Parts label form FRM-SE-0002, "SPAP Sample Parts" on the EMD website.

L. **Appearance Approval** – Evidence for compliance of the part appearance is required for parts that are painted or otherwise finished (e.g. zinc dichromate, phosphate and oil finishing, etc.).

The supplier must comply with the requirements of AI 2719, "Surface Finish Requirement" where required. Please refer to AI 2719 for specific requirements. Contact your Buyer for a copy of the latest version of this document.

For painted parts, typical evidence of conformance includes:

- Technical data sheets from the manufacturer of the primers and top coat paints used. The sheets must indicate the use of the correct EMD approved primers / paints (reference AI 2719).
- Evaluation of color match and gloss as compared to master color and gloss chip. Master chips can be purchased from the paint manufacturer. EMD suggests reporting the results of this evaluation on the Inspection report.
- Film thickness measurement
- Adhesion and other specified test results in accordance with testing and methods referenced in AI 2719.
- Visual inspection for the presence of visual paint discontinuities and defects such as dings, weld spatter, drips, orange peel, etc. as referenced in the "Appearance" section of AI 2719. EMD suggests reporting the results of this evaluation on the Inspection report.
- Visual assessment for conformance to any paint masking diagrams that are applicable to the part. EMD suggests the reporting of this evaluation on the Inspection report.

For other finish surfaces, certificates of conformance from the organization providing the finishing service may be provided.

If you are unclear on the specific requirements for appearance approval, consult you EMD SQE for clarification.

M. Measurement Systems Analysis – Measurement systems studies are to be provided when requested to indicate the ability of the measurement system to reliably measure the associated feature(s). EMD requires these studies only for measurement systems that measure special characteristics that are identified on the drawing.

Measurement system studies should follow the requirements of the AIAG Measurement Systems Analysis (MSA) Manual which can be purchased from the AIAG.

If the measurements are attribute in nature (i.e. they generate only a Pass / Fail result), then EMD recommends the AIAG Attribute Gage Study method.

If the measurements are variable in nature (i.e. they result in a numerical value, such as 1.245 inches, rather than just a Pass / Fail result), then EMD recommends the Supplier use the AIAG Average and Range method to assess the measurement system due to its more simplistic approach.

There are other suitable methods for assessing measurement system effectiveness that can be used. If you will be using an alternate method, contact your SQE in advance to ensure acceptability.

N. Process Capability – EMD requires process capability results for special characteristics only, unless otherwise requested by the EMD SQE. Refer to form FRM-SE-0015 "EMD Process Capability Report" for further information on sample sizes, acceptance criteria for the analysis, etc.

If the required targets for process capability cannot be met for special characteristics, then the Supplier must initiate a 100% inspection activity for those characteristics. This 100% inspection activity must be documented on the process control plan.

O. Packaging Instructions / Images –The Supplier must submit a copy of the supplier's packaging instruction or equivalent instructional document. The Supplier is responsible to package the part in a manner that adequately protects the parts from damage or other negative effects due to the environment through which the part is transported and in which the part is stored. The packaging must also meet all other EMD packaging criteria (i.e. no supplier logo on parts or packaging). This requirement exists regardless of the final destination of the shipped part and Supplier should consider the packaging needs for parts that are shipped via ground transportation in the USA versus, for example, the same part that may be shipped via ship overseas. A packaging instruction that indicates the planned method(s) for packaging must be submitted

In addition to the packaging instruction, image(s) of the packaged parts that illustrate the packaging shall

also be submitted as part of the SPAP unless otherwise waived by EMD. Please refer to the EMD Shipping and Packaging Manual on the EMD website for shipping and packaging requirements.

Records Retention

The Supplier shall maintain a copy of the approved SPAP with all supporting documentation for as long as the part is active plus a minimum of seven years. The Supplier shall provide copies of the approved SPAP and supporting documents at any time within that retention period upon EMD request.

REVISION HISTORY:

Revision	Revised By	Description of Changes
D	Greg Prong	Initial release under new format.
E	Greg Prong	• Modified part criticality labels in Table 1 to be “High Risk”, “Medium Risk” and “Low Risk”. • Added DFMEA element to Table 1 as part of the potential SPAP submission requirements. • Changed submission requirements in Table 1 for the process capability element and the gauge R & R element. • In section O, re-named the reference to the “Shipping and Packaging” manual to match the text of the hyperlink on the www.progressrail.com website. • Corrected some hyperlinks and made minor formatting changes.
F	Greg Prong	• Modified references to the DA system (now called Deviation system) to reflect the most recent changes to the Deviation system. • Minor wording improvements to various sections of the document.
G	Greg Prong	• Added section 3, “Acknowledge” phase to reflect the update SPAP workflow / phases. • Modified to reflect the new use of the ETQ SPAP system for production tooling qualification for EMD / Progress Rail manufacturing tooling, where such tooling is purchased from tooling sources outside of EMD / Progress Rail. • Updated hyperlinks to reflect document locations on the revised Progress Rail website.