

April 7, 2021

## **Summary of Changes**

### **095871 Contract Deliverable Requirements (CDR)**

#### **Rev 15**

This serves as notification that our BAE Systems Contract Deliverable Requirements (CDR) has been updated. Please see the following changes/additions/deletions:

Legend:

- Addition
- Change
- Deletion

#### **003 First Piece Inspection Report**

The Supplier shall submit their First Piece Inspection Report as specified in the SQAM paragraph 8.3. The data shall be submitted and approved prior to shipment of the item in accordance with the Data Submission Instructions located in the Supplier Quality Assurance Manual (SQAM) paragraph 8.12 for this item.

#### **004 First Article Test (FAT)**

When any of the First Article criteria exist, a First Article Test may be required to validate that the production processes are producing results within specification. In the event that a First Article Test is required, BAE Systems will adjust order quantities accordingly in order to define additional parts for the testing. The data shall be submitted and approved prior to shipment of the item in accordance with the Data Submission Instructions located in the Supplier Quality Assurance Manual (SQAM) paragraph 8.12 for this item. *Suppliers are required to inform the BAE Systems Quality Department in writing using VIR 089725 when any of the following occur for any operation or step in the supply chain/manufacturing process prior to shipment of any affected product.*

- 1.) *Change in manufacturing process at tier 1 or any sub-tier suppliers (BAE Systems to be notified prior to the change being made)*
- 2.) *Drawing changes provided by BAE Systems or any/all suppliers*
- 3.) *Manufacturing location change at tier 1 or any sub-tier suppliers (BAE Systems to be notified prior to the change being made)*
- 4.) *Break in production of 24 months or more at any sub-tier suppliers.*

*When any of the First Article criteria exist, a First Article Test may be required to validate production processes are producing results within specification. In the event that a First Article Test is required, BAE Systems will adjust order quantities accordingly in order to define additional parts for the testing.*

The Supplier shall update/resubmit the FAT plan within 30 days following contract award and cover any changes to the schedule prior to start of the test. The procedure and test reports may be prepared using MIL-HDBK-831 as a guide. BAE Systems and its customer reserve the right to witness FAT testing at any point in the schedule.

### **005 Customer Source Surveillance (CSS)**

Source surveillance, inspection, and/or test by a BAE Systems source inspection representative is required for each shipment of this item. In order to accommodate BAE Systems source inspection representatives, the Supplier shall make all facilities, equipment, inspection records, and assistance readily available.

The Supplier shall provide five (5) working days advance notification of requests for source inspection through submission of Form 092245 for **Combat Vehicles and Form 089559 for Weapon Systems**. Requests shall be submitted in accordance with the Data Submission Instructions (located in the SQAM) paragraph 8.12 specified for this item. Unauthorized/unapproved shipment of product without BAE Systems source inspection may result in the shipment being rejected, a supplier corrective action request may be issued and product may be returned to the Supplier at the Supplier's expense.

If parts are returned for repair or rework, a resubmission of source is required. Parts are not to be shipped until the resubmission source has been approved and the source form is annotated with: 'Repair or Rework', and lists the NCR number on the form as applicable.

### **007 Welding-Combat Vehicles**

This CDR has changes all throughout.

- Suppliers SHALL be up-to-date with the required Weld Process Audit PRIOR to submitting Weld Procedure(s) to BAE Systems Weld Engineering for review. Suppliers SHALL provide supporting documentation and evidence for a Weld Process Audit in accordance with the requirements listed in the SQAM. All supporting documentation SHALL be made available to BAE Systems upon request.
- **PRIOR** to the start of fabrication, the Supplier **SHALL** review WE-005 and submit all procedure(s) and supporting qualification test data to the BAE Systems Weld Engineering Representative. The Supplier **MAY** utilize BAE Systems Weld Procedure Specification(s) (WPS) in the event that the Supplier has completed the BAE Systems required Weld Training.
- In the event that the Supplier is **NOT** approved to utilize BAE Systems Weld Procedures and/or BAE Systems **DOES NOT** have applicable Weld Procedure(s) to fabricate the Weldment to fulfill the purchase order, the Supplier **SHALL** be responsible for providing and/or qualifying Weld Procedure(s) **PRIOR** to fabrication. BAE Systems Weld Engineering **SHALL NOT** be responsible for providing additional procedure qualifications for the sole use of our Suppliers.
- The Supplier **SHALL** submit the WPS(s) intended for part fabrication to BAE Systems Weld Engineering for review and approval via the Supplier Welding Procedure Submission Form 089136 **PRIOR** to the start of fabrication. The latest version of the form **SHALL** be utilized and is accessible via the BAE Systems Purchasing Website. Each Weldment Part Number and the applicable WPS(s) **SHALL** be submitted individually.
- In the event that the Supplier provides a non-BAE Systems qualified Weld Procedure, the Procedure Qualification Record(s) **SHALL** be submitted along with the respective WPS(s) for review.
- Supplying product to BAE Systems with an unapproved, rejected, and/or incorrect Welding Procedure Specification (WPS) is a violation of the BAE Systems Purchasing Agreement and is considered non-

conforming and parts are subject to rejection and **MAY** be returned to the Vendor (RTV) at the Supplier's expense.

- The Supplier **SHALL** resubmit the Supplier Welding Procedure Form to BAE Systems Weld Engineering in the event that the Base Material, Weld Procedure(s), and/or the Part Number Configuration changes from the previously approved form. The form **SHALL** also be resubmitted if the BAE Systems Purchasing Agreement Part Number changes throughout configuration, regardless if all other variables have remained consistent from the previously approved form.
- The Supplier **SHALL** be responsible for maintaining all supporting documentation including, but **NOT** limited, to the following; Performance Qualifications, Sub-Tier Supplier Certifications, Machine Calibration Documentation, and other applicable documentation required to demonstrate compliance in accordance with the requirements per the BAE Systems Purchasing Agreement. All documentation **SHALL** be made available as requested BAE Systems at all times.
- Supplier **SHALL** submit Standard and Non-Standard Repair Procedure(s) via the Vendor Information Request (VIR) Form 097908 for review and approval **PRIOR** to use.

### **Aluminum and Steel Arc Welding; Resistance Welding and Brazing**

Procedure submittal requirements for aluminum, steel, resistance, and brazing weldments are addressed on the following forms/ procedures:

<b>Form Number/ Procedure</b>	<b>Document Title</b>
090451	Visual Testing Inspection In Accordance With Ground Combat Vehicle Welding Code – Aluminum (12472301)
090504	Visual Testing Inspection In Accordance With Ground Combat Vehicle Welding Code – Steel (12479550)
091866	Brazing or Braze Welding Procedure - Cover Sheet (LAA-5130)
091868	Recorded Joint Welding Procedure for Resistance Welding Cover Sheet (LAA-5131)
091869	<b>Weld Submittal Requirements and Instructions (LAA-5272)</b>
092587	Weld Supplier Approval and Weld Procedure Submission Process Guideline (WE-005)
092579	SRP Repair of Steel Base Metal (WE-SRP02)
092580	SRP Repair of Aluminum Base Metal (WE-SRP01)
092589	BAE Systems Code Qualified Suppliers
092585	BAE Systems Weld Procedure Book - Steel
092586	BAE Systems Weld Procedure Book - Aluminum
089136	Supplier Welding Procedure Submission Form
089725	<b>Vendor Information Request</b>

Forms are available via the [BAE Systems Purchasing Website](#) and/or a BAE Systems Authorized Purchasing Representative.

Ground Combat Vehicle Welding Code – Aluminum (12472301) replaced the following specifications (reference page 4, Table P.1):

- MIL-STD-1946
- MIL-STD-372
- MIL-W-45205
- MIL-W-45206

Ground Combat Vehicle Welding Code - Steel (12479550) replaced the following specifications (reference page 4, Table P.1):

- MIL-STD-1261
- MIL-STD-1941
- MIL-STD-1185
- MIL-W-46086

### **007B Welding- Combat Vehicles: Additional Weld Requirements**

The Supplier **SHALL** reference the applicable code designated on the BAE Systems Purchase Order and Contract Quality Requirements and its entirety. The Supplier **SHALL** be responsible for reviewing **AND** adhering to the **ALL** requirements listed in the designated Weld Code.

#### **Aluminum:**

In addition to the requirements specified in CDR007, additional Aluminum Weld Requirements, the following requirements do **NOT** encompass **ALL** changes implemented within the specified Weld Code:

- Weld Procedure Qualifications: the requirements for utilizing Multiple Welding Processes within a single procedure has updated
- Operator Qualifications: the requirements for the Number of Electrodes an Operator is qualified to utilize has updated

#### **Steel:**

In addition to the requirements specified in CDR007, additional Steel Weld Requirements, the following requirements do **NOT** encompass **ALL** changes implemented within the specified Weld Code:

- Weld Procedure Qualifications: the requirements for Preheat/Interpass Temperature, Travel Speed, Heat Input, and Charpy V Notch (CVN) Testing have updated
- Non-Destructive Testing (NDT): Following welding, for all high strength steels and armor grade steels greater than 0.25" (6mm) in thickness, the final NDT examination for acceptance shall be conducted no less than 48 hours after the final weld has cooled to ambient temperature. Preliminary NDT examinations are advisable to avoid production related delays by identifying defects not related to delayed hydrogen cracking. These defects can be addressed before the 48 hour hold is complete, restarting the 48 hour period. Defects identified and addressed following the first 48 hour hold shall be subject to an additional 48 hour hold. Alternative strategies to mitigate delayed hydrogen cracking must be supported by data and shall be submitted to the procuring activity for review for acceptability prior to amending the length of this hold time.
- Procedure Transfers: It is allowable to transfer qualified and approved welding procedure(s) between an entity and its sub-entities, for all classes of welds. The receiving transferee (Supplier and/or Fabricator) **SHALL** create an initial validation test plate using the WPS parameters to qualify for welding with the WPS in accordance with the applicable Weld Code.
  - The sub-entity **SHALL** submit the BAE Systems Validation Test Plate Data Sheet and document the applicable information as required. Failure to provide the necessary information **SHALL** result in the ineligibility to utilize the entity's Weld Procedure(s).

- A re-Validation Test **MAY** be required to demonstrate that the sub-entity is capable of adhering to the requirements specified in accordance with the Weld Procedure in question, as a result of the following events:
  - Non-conformance(s) identified during a Weld Process Audit conducted by BAE Systems' Supplier Quality Team
  - Non-conforming welded part(s) received by BAE Systems

### 008 Welding-Weapon Systems

- Prior to the Supplier's start of fabrication (or repair to raw material, casting, forgings, etc.), the Supplier shall submit procedure(s) and supporting qualification test data in accordance with the applicable specifications (including weld personnel certifications) and [form 091721](#) to the BAE Systems Authorized Purchasing Representative
- Supplying product to BAE Systems without an approved Welding Procedure Specifications (WPS) is cause for rejection
- The WPS shall include the Procedure Qualification Record (PQR) for the process when applicable
- The Supplier is responsible for the performance and maintenance of all supporting documentation required to demonstrate compliance with the Purchasing Agreement requirements
- Changes/revisions to previously approved weld procedures must be submitted for re-approval

### 016 Plating

The supplier shall provide written certification that the plating was performed in accordance with all Purchasing Agreement, drawing, and Purchasing Agreement specification requirements prior to or with shipment of the product. The facility actually performing the plating shall prepare the certification. **When baking for hydrogen embrittlement relief is required, the certification shall define the required bake time and bake temperature. The actual bake temperature and bake time the items were baked must be listed as well in accordance with the latest revision level of the specification.**

The Certification **MUST** include as a minimum:

- Part number
- Purchasing Agreement number
- Plating process specification used
- **Baking temperature**
- **Baking time**
- **A statement that the baking operation was started within 3 hours of plating completion**
- Complete lot traceability to all certifications related to the BAE Systems Purchasing Agreement
- Printed name, signature, and title of Supplier's representative
- Report date

The certification/data shall be submitted and approved prior to shipment of the item in accordance with the Data Submission Instructions located in the Supplier Quality Assurance Manual (SQAM) paragraph 8.12 for this item.

### **The following requirements apply when zinc plating per ASTM B633 is specified:**

When embrittlement relief pretreatments and/or post treatments are required and unless otherwise specified on the component, drawing the following requirements shall apply:

- A) Pretreatment on steel parts with a tensile strength 1000 MPa (31 HRC) or greater that have been machined, ground, cold-formed, or cold-straightened subsequent to heat treatment. Bake times and temperatures shall be in accordance with Table 1 of ASTM B849.
- B) Post coating treatments for the purpose of reducing the risk of hydrogen embrittlement in accordance with ASTM B850 on iron or steel parts having a tensile strength  $\geq 1000$  MPa (with corresponding hardness values 303 HB, or 31 HRC) and surface-hardened parts unless otherwise specified. Bake times and temperatures shall be in accordance with Table 1 of ASTM B850.
- C) The certification shall also include:
  - Baking temperature; Requirement and Actual
  - Baking time; Requirement and Actual
  - A statement that the baking operation was started within 3 hours of plating completion

### 023 Age Control

Age-sensitive items include, but are not limited to, paint, adhesives, and rubber products. The following requirements apply to all items with this requirement:

- Age-sensitive items shall be delivered as directed by the requirement assigned below.
  - a) With a minimum of 50% of the shelf life remaining
  - b) With a minimum of 75% of the shelf life remaining.
  - c) With a minimum of 85% of the shelf life remaining.
  - d) Other as directed by contract.
- All age-sensitive items and their respective shipping containers shall be permanently marked with the cure/manufacture and expiration dates in addition to any other required markings
- For parts delivered on a spool or reel, the marking must be applied to a visible location on the outside of the spool or reel
- The cure/manufacture and expiration dates shall be in either Quarter/Year format (for product with a shelf life in excess of three (3) years) or Month/Year format (for product with a shelf life of three (3) years or less). The method of marking and the marking height shall be in the manufacturer's format, however the marking shall not affect the part's form, fit, or function

Example:                   CURE 4Q/2010  
                                   EXP 4Q/2016

- In addition to the requirements of SQAM paragraph 8.5, **When a Certificate of Conformance for age sensitive items is required it shall include:**
  - a) Lot traceability by run, batch, lot, or date of manufacture
  - b) Shelf life expiration date (as required by specification)
  - c) Storage conditions to achieve shelf life, if not stated on the material package

### 026A Quality System Requirements

The Supplier shall maintain on file, and provide to BAE Systems upon request, objective quality evidence demonstrating Registration/Certification by an approved Registrar to ISO 9001, AS 9100, TS 16949, ISO/IEC 17025 or other recognized Quality System Standard. When the Registration/Certification Certificate is requested by BAE Systems, the documentation shall be provided in a commonly readable electronic format and shall be provided to BAE Systems in accordance with the Data Submission Instructions (located in the SQAM) paragraph 8.12 or uploaded to HICX.

### **030C NADCAP Approved Special Processes**

All special processes identified herein and utilized on a BAE Systems purchase order/subcontract require certification by NADCAP. NADCAP Certification will be required for heat treating, painting/coating (non-CARC) and plating. These Special Process requirements identified herein shall be flowed down to all sub-tier suppliers as applicable. The supplier shall provide a current Certificate of Conformance (C of C) certifying compliance for the special process identified and performed as required by the TDP. All Special Process suppliers or their sub-tier suppliers utilized on the purchase order/subcontract shall have a current accreditation by NADCAP. The Certificate of Compliance shall define and document each process used in satisfying the TDP/Subcontract requirements and the date of the last audit. Special processes will be as defined in our SQAM, AS9100 and by NADCAP. All costs associated with NADCAP accreditation shall be borne by the Special Processor. The NADCAP Certificate shall be provided to BAE Systems in accordance with the Data Submission Instructions (located in the SQAM) paragraph 8.12 or uploaded to HICX when requested.

### **034 Ballistic Requirements - Metal and Composite Materials**

#### **FIRING RECORDS (Plate and Composite):**

The Supplier shall provide a copy of the:

- Physical and Chemical Test Reports
  - a. For non-armor options allowed per the print, the supplier shall submit the physical and chemical test reports for the optional material used. BAE Systems shall be notified of the use of the optional material during documentation submittal.

Government Ballistic Test Certification, including firing number for each heat/lot of ballistic material. Results shall be submitted and approved prior to shipment of the item in accordance with the Data Submission Instructions located in the Supplier Quality Assurance Manual (SQAM) paragraph 8.12 for this item.

- **FIRING RECORDS (CASTING):**

For armor castings and extrusions, the Supplier shall maintain a listing of Government approved firing numbers for all material recipes supplied to BAE Systems. Results shall be submitted and approved prior to shipment of the item in accordance with the Data Submission Instructions located in the Supplier Quality Assurance Manual (SQAM) paragraph 8.12 for this item.
- **FIRING RECORDS (FORGINGS):**
  - Aluminum Armor Forgings require ballistic test for each lot, including longitudinal and transverse tensile tests per MIL-DTL-45225 and the material certificate of analysis.
  - Ferrous Armor Forgings require ballistic test for each lot, including results for all testing specified in the ballistic test specification and the material certificate of analysis.

Results shall be submitted and approved prior to shipment of the item in accordance with the Data Submission Instructions located in the Supplier Quality Assurance Manual (SQAM) paragraph 8.12 for this item.

#### **MACHINING ALLOWANCES FOR ARMOR PLATE**

In general, mill certifications and ballistic test certifications are required to be provided at the thickness designated on a drawing's material note. In instances where there is no requirement for the thickness of armor material designated in the material note, the following requirements shall apply –

- If the thickness of the armor material is not specified on the material note, thicker material may be procured and machined to final size with the following limitations.
  - MIL-DTL-46027 – allowable to machine 25% from the original thickness to meet requirement.

- MIL-DTL-32375 (Class 1, All Grades) – allowable to machine 10% from the original thickness to meet requirement.
- MIL-DTL-12560 (Class 1) – allowable to machine within the applicable hardness ranges specified in Table 1 in this section.
- MIL-DTL-12560 (Class 2 & 4) – allowable to machine 25% from original thickness to meet requirement.
- MIL-DTL-46100 – allowable to machine 25% from original thickness requirement.
- When assessing machining allowances per the above requirements, measurements shall be taken from nominal ordered thickness to the nominal measurement at the thickest section of the component as designated on the drawing.
- Exceptions outside of the allowances in this document must be reviewed and approved by BAE Systems engineering and requires the submission of a VIR.

Per previous, these allowances for machining of armor product from thicker procured plates is only applicable when a material thickness is not designated in the material note. Note that Class 3 MIL-DTL-12560 armor is not allowable for use in the fabrication of vehicle product and is typically used for other test and evaluation purposes. As a result, machining allowances for this material require submission of a VIR if procured in a thickness other than that requested in the PO.

*Table 1. Machining Allowances for MIL-DTL-12560 Wrought Armor Plate.*

Armor Class (MIL-DTL-12560)	Allowable Machining Ranges
1	.098 - .249 incl.
	.250 - .624 incl.
	.625 – 1.125 incl.
	1.126 – 1.999 incl.
	2.000 – 3.999 incl.
	4.000 – 6.000 incl.
2	25% original thickness
4	25% original thickness

## MATERIAL REDUCTION OF ARMOR PLATE (STEEL & ALUMINUM)

During the handling and fabrication of armor plates, occasionally small material defects – such as mechanical gouges and scratches – accumulate on the plate surface. In general, surface imperfections that do not affect the functionality of the material or its fitness for fabrication are acceptable and do not need to be repaired. These requirements are outlined in Paragraph 3.11 (MIL-DTL-46027), Paragraph 3.9 & 3.10 (MIL-DTL-32375), and Paragraph 3.2.11 (MIL-DTL-46100 and MIL-DTL-12560).

Given that it is difficult for vendors to assess what surface imperfections may affect the functionality or serviceability of a plate in fabrication, vendors shall assess surface imperfections based on the following criteria –

- Identify indications of surface imperfections visually and determine base material type and thickness per applicable engineering drawing.
- Measure plate thickness at the indication site via ultrasound thickness gage, caliper, or other process approved by BAE Systems SQA representative.
  - Ultrasound thickness gage measurements shall be taken at the deepest area of the surface imperfection. In instances where an indication cannot be assessed in this manner, measurements shall be taken adjacent to the indication.
  - Measurements by caliper or mechanical measurement shall be taken at the plate edge nearest the indication. A depth gage shall then be used to measure the depth of the imperfection at its deepest point and subtracted from the as-measured thickness to determine final thickness in the area of the indication.
  - Imperfections may be deburred in order to allow effective measurement of the indication.

- Compare the measured thickness of the plate to the minimum allowable material thickness per applicable specification. In instances where the thickness at the location of the indication is defined on the drawing, refer to the applicable drawing tolerances for the minimum allowable material thickness.

If material is found to meet or exceed the minimum thickness at the deepest point of the defect, it is acceptable as-is and no repair is needed. All surface imperfections deemed acceptable by this method shall be deburred to remove sharp edges. If the material is found to be thinner than the minimum allowable thickness at the deepest point of the defect, the material is non-conforming to specification and shall be rejected. Alternatively, vendors with defective indications may submit a VIR to authorize a repair or use as-is.

Table 2. Thickness Tolerances for MIL-DTL-46027.

Ordered Thickness (Inches)		Allowable Material Reduction from Specified Thickness (Inches)
Over	Thru	Minus Tolerance
.250	.315	.018
.315	.394	.023
.394	.630	.032
.630	.984	.043
.984	1.575	.055
1.575	2.362	.070
2.362	3.000	.100

Table 3. Thickness Tolerances for MIL-DTL-32375.

Ordered Thickness (Inches)		Allowable Material Reduction from Specified Thickness (Inches)
Over	Thru	Tolerances ( $\pm$ )
.500	1.000	.043
1.001	1.575	.055
1.576	2.362	.070
2.363	3.000	.100

Table 4. Thickness Tolerances for MIL-DTL-12560.

Ordered Thickness (Inches)		Allowable Material Reduction from Specified Thickness (Inches)
Over	Thru	Tolerances ( $\pm$ )

.2500	.3749	.022
.3750	.6249	.025
.6250	.9990	.030
1.0000	1.4990	.035
1.5000	1.9990	.045
2.000	2.9990	.065
3.000	3.9990	.070

Table 5. Thickness Tolerances for MIL-DTL-46100.

Ordered Thickness (Inches)	Allowable Material Reduction from Specified Thickness (Inches)
Specified Thickness	Tolerances (±)
.1250-.3125	.019
.313-.750	.023
.751-1.000	.026
1.001-1.1875	.031
1.188-1.4375	.036
1.438-1.5625	.039
1.563-1.750	.043
1.751-2.000	.048

**THERMAL CUTTING OF STEEL ARMOR PLATE:**

Shall meet the following requirements:

- Parts produced by thermal cutting of plate material shall be subject to process qualification. Submission of parts which are thermally cut, shall meet the following requirements:

**APPLICABILITY:**

- Thermal cutting processes include any methods, which rely on, or result in, the generation of temperatures in excess of 1,300 °F at the point of cutting. These processes include (but are not limited to) laser, plasma, and the family of oxy-fuel cutting processes. These processes do not include abrasive cutting methods such as waterjet, abrasive disk or saw, and machining. Products that are first cut by thermal process (such as plasma) and then finished to final dimension by abrasive method (such as machining or grinding) are **not** subject to the qualification requirements for thermal cutting processes.
- MIL-DTL-46100 materials, all tempers.
- MIL-DTL-12560 materials, Class 1, Class 2, Class 4a, and Class 4b. Qualification for cutting of Class 1, Class 4a, or Class 4b material shall be applicable to cutting of Class 2 material. Class 3 armor is not intended for use in vehicle applications and is exempt from the requirements of this section.
- MIL-DTL-32332 materials, all tempers.

- MIL-A-11356 materials, all tempers.

#### PROCEDURE:

- Supplier shall have a written and controlled Procedure for cutting steel armor. Documentation of the Procedure shall be made available to BAE Systems on request.
- Initial Procedure Qualification Test: The supplier shall produce a production quality sample in order to verify that the Procedure is capable of achieving edge quality in accordance with the applicable material specification. Documentation for this test shall be submitted to BAE Systems representatives for acceptance prior to working on production parts. The required tests for initial procedure qualification are as follows:
  - Sample coupons shall be cut with process to be qualified. Coupons may be on a production part, a sample attached to a production lot, or an independent sample.
  - Visual inspection, no indications of cracking along cut plate edges is acceptable.
  - Non-destructive testing (NDT) per ASTM E1417 or ASTM E1444 or equivalent. Acceptance criteria in accordance with the applicable material standard.
  - Heat affected zone hardness (HAZ) to be determined by hardness indentation at the mid-length of the cut edge. 5 measurements shall be taken, equally spaced, from the cut edge to a distance of 1.2T or .625 inches (whichever is less).
- Procedure Documentation: Once the Supplier has completed the evaluations outlined by the Initial Procedure Qualification Test, documentation of the test results shall be submitted to BAE Systems for final review and approval. This report shall contain form 089475 and the following information at minimum:
  - Material documentation: Includes material standard, temper, heat or lot number, and material thickness tested.
  - Process documentation: Includes process type (e.g. plasma, laser, oxy-fuel), method of cutting (manual or automatic), and environment (e.g. ambient condition, water immersion, controlled non-reactive environment).
  - Major Processing Parameters: Includes the primary processing parameters affecting the quality of the cut edge. Some examples are shown below but should not be considered an exhaustive list.
    - Laser: Beam source, cutting power, travel speed, primary shielding gas, travel speed, minimum pre-heat & post-heat (if applicable).
    - Plasma: Electrode type, voltage, primary cutting gas, travel speed, minimum pre-heat & post-heat (if applicable).
    - Oxy-Fuel: Cutting gas, gas pressure, travel speed, minimum pre-heat & post-heat (if applicable).
  - Secondary Processing: In some cases, suppliers may elect to use secondary tempering, grinding, or machining processes to ensure the quality of the cut edge and decrease the propensity for cracking. In these cases, **suppliers are not required** to submit their secondary processing as part of the qualification for their thermal cutting procedure. **This information may include time and temperature of tempering, or method of material removal (grinding or machining) and amount of material removed from the cut edge.**
  - Documentation shall be provided with the results of visual inspection and NDT in accordance with the Initial Qualification Test. Supplemental documentation may be attached to support NDT results.
  - Documentation shall be provided with the results of the Initial Qualification Test. Supplemental documentation may be attached to support the results of NDT and hardness testing.
  - Date, printed name and electronic or hard copy signature shall be included to confirm the validity of the test results from the contracted vendor's authorizing authority. In instances

where a vendor sub-contracts work to a secondary shop, the authorizing signature shall be provided by the primary vendor. In these cases, the primary vendor will be responsible for maintaining the qualification records and is accountable for products contracted to them, but processed by that secondary shop.

#### PROCEDURE APPROVAL & PERIOD OF QUALIFICATION:

- Supplier shall have the Procedure Qualification for Thermal Cutting of Steel Armor Form number 089475 completed and approved by BAE Systems Materials Engineering prior to shipment of product. This should include all provisions of the Procedure Documentation listed.
- The form shall be submitted per Data Submission instructions (located in the SQAM) paragraph 8.12 for this part.
- After final approval, period of qualification shall be indefinite unless there is reason to believe that the Qualified Procedure is no longer capable of meeting the edge quality requirements of the applicable material specification.
- Rejection of a submitted Procedure Documentation for qualification, or revocation of an existing qualification, shall be followed by corrective action for requalification by BAE Systems.

#### EFFECTIVITY OF QUALIFICATION:

- A qualified procedure is applicable to the following ranges. For a given tested material thickness, that process qualification shall be sufficient for the same process used on materials applicable to the qualification test.
  - $.380 < T$
  - $.380 \leq T < .625$
  - $.625 \leq T < 1.000$
  - $T \geq 1.000$
  - Example: Vendor A qualifies a laser cutting process, using a CO<sub>2</sub> beam source at 4,500 Watts, at 100 IPM on .500 on Class 1 MIL-DTL-46100 material. That qualification is sufficient to cover MIL-DTL-46100 Class 1 materials, to a minimum thickness including .380 and a maximum thickness excluding .625.
- Procedures qualified prior to Rev 09 shall remain in effect under the provisions of this release unless there is reason to believe that the Qualified Procedure is no longer capable of meeting the edge quality requirements of the applicable material specification.

#### PROCESS INSPECTION:

- Only qualified inspection personnel shall conduct visual and NDT process inspections. Documentation of inspection personnel's qualification shall be kept and provided to BAE Systems on request.
  - Inspection personnel shall be certified per a written practice in accordance with ASTM SNT-TC-1A, AWS QC1, CSA W178.2, or comparable.
  - Alternatively, an engineer or technician who by training and experience in metals fabrication, inspection, and testing, is competent to perform the inspection of thermally processed material (welding, cutting, and/or heat treating) may be considered qualified inspection personnel for the purposes of this process inspection.
- Process inspection shall consist of the following:
  - Visual inspection to be performed by qualified personnel, conducted in accordance with the supplier's procedure. Inspection frequency shall be 100%.

- Non-destructive testing (NDT) in accordance with ASTM E1417, ASTM E1444, or equivalent. Frequency shall be General Inspection level II, AQL 2.5%, spec ANSI/ASQ Z1.4. If rejectable indication is found, institute 100% inspection of subject lot.

**DEFINITION:**

Lot – Shall mean “inspection lot” or “inspection batch” of parts of the same material, the same thickness and processed continuously under one Procedure.

Example – Supplier A cuts 10 Part Numbers, with different quantities, all from the same thickness of high hardness armor. If they are processed (cut) in a constant continuous process, then the collection of parts can be inspected as one Lot.

## **057 PPAP-Level 2**

The Supplier shall complete a PPAP in accordance with Level 2 of the Production Part Approval Process (PPAP) manual and shall submit the following to BAE Systems for approval:

Design Record

Engineering Change Documents (if applicable)

Dimensional Results with ballooned drawing (all characteristics, including drawing notes, numbered)

Photograph of the part marking

Material, Performance Test Results

Qualified Laboratory Documentation

Appearance Approval Report (if applicable)

Sample Product

Part Submission Warrant (PSW)

All other requirements of the PPAP shall be completed, retained on file, and made available to BAE Systems upon request.

The Supplier shall not ship product to BAE Systems prior to receipt of a signed/approved PSW. Product shipped in advance of PPAP approval shall be subject to rejection and may be returned at the supplier's expense.

Process or product changes require PPAP resubmission. Notification to BAE Systems prior to changes is essential, as additional audits/reviews may be required prior to resubmission; such changes are to be communicated to your BAE Systems Procurement Representative via the Vendor Information Request Form (Form 089725, replaced 097908). Process or product changes are defined as changes in the processing of the product that could affect its ability to meet design, durability, and reliability requirements, including:

- Use of a process or material other than those which were previously approved,
- Production from new or modified tools (except perishable tools), dies, molds, patterns, etc., including additional or replacement tooling,
- Production following any refurbishment or rearrangement of existing tooling or equipment,
- Production from tooling and equipment transferred from another manufacturing site,
- Change of a supplier for parts or services (e.g. heat treating, plating, welding),
- Break in production or product produced after tooling has been inactive for 24 months or more,
- Any change in material, including not only raw material but also chemical compounds or processes (i.e. paints, adhesives, sealers, lubricants, plating, heat treat processes, etc.) which become part of the

finished product; this includes changing to an engineering approved alternative material or any change in the sequence of operations,

- Upon request of BAE Systems' Purchasing Representative.

The data shall be submitted and approved prior to shipment of the item in accordance with the Data Submission Instructions located in the Supplier Quality Assurance Manual (SQAM) paragraph 8.12 for this item.

### **058 PPAP-Level 3**

The Supplier shall complete a PPAP in accordance with Level 3 of the Production Part Approval Process (PPAP) manual and shall submit the following to BAE Systems for approval:

Design Record

Authorized Engineering Change Documents (if applicable)

Customer Engineering Approval (if required)

Design Failure Modes and Effects Analysis (DFMEA)

Process Flow Diagrams

Process Failure Modes and Effects Analysis (PFMEA)

Control Plan

Measurement System Analysis Studies

Dimensional Results with ballooned drawing (all characteristics, including drawing notes, numbered)

Photograph of the part marking

Material, Performance Test Results

Records of Material / Performance Test Results

Initial Process Studies

Qualified Laboratory Documentation

Appearance Approval Report (AAR) if applicable

Sample Production Parts

Master Sample

Checking Aids

Customer Specific Requirements

Part Submission Warrant (PSW)

All other requirements of the PPAP shall be completed, retained on file, and made available to BAE Systems upon request.

The Supplier shall not ship product to BAE Systems prior to receipt of a signed/approved PSW. Product shipped in advance of PPAP approval shall be subject to rejection and may be returned at the supplier's expense.

Process or product changes require PPAP resubmission. Notification to BAE Systems prior to changes is essential, as additional audits/reviews may be required prior to resubmission; such changes are to be communicated to your BAE Systems Procurement Representative via the Vendor Information Request Form (Form 089725, replaced 097908). Process or product changes are defined as changes in the processing of the product that could affect its ability to meet design, durability, and reliability requirements, including:

- Use of a process or material other than those which were previously approved,
- Production from new or modified tools (except perishable tools), dies, molds, patterns, etc., including additional or replacement tooling,
- Production following any refurbishment or rearrangement of existing tooling or equipment,

- Production from tooling and equipment transferred from another manufacturing site,
- Change of a supplier for parts or services (e.g. heat treating, plating, welding),
- Break in production or product produced after tooling has been inactive for 24 months or more,
- Any change in material, including not only raw material but also chemical compounds or processes (i.e. paints, adhesives, sealers, lubricants, plating, heat treat processes, etc.) which become part of the finished product; this includes changing to an engineering approved alternative material or any change in the sequence of operations,
- Upon request of BAE Systems' Purchasing Representative.

The data shall be submitted and approved prior to shipment of the item in accordance with the Data Submission Instructions located in the Supplier Quality Assurance Manual (SQAM) paragraph 8.12 for this item.

### **059 PPAP-Level 4-Predefined Requirements**

The Supplier shall complete a PPAP in accordance with Level 4 of the Production Part Approval Process (PPAP) manual and shall submit the following to BAE Systems for approval:

- Design Record
- Authorized Engineering Change Documents (as applicable for Supplier Designed Product)
- Customer Engineering Approval (if required)
- Process Flow Diagrams
- Process Failure Modes and Effects Analysis (PFMEA)
- Control Plan
- Dimensional Results with ballooned drawing (all characteristics, including drawing notes, numbered)
- Photograph of the part marking
- Records of Material / Performance Test Results
- Initial Process Studies (for Critical/Safety/Significant Characteristics identified on the drawing)
- Qualified Laboratory Documentation
- Checking Aids (Picture of non-standard/special acceptance fixtures, e.g. holding fixture, not applicable to standard inspection equipment, i.e. calipers)
- Customer Specific Requirements
- Process Certifications / Material Performance Test Results
- Part Submission Warrant (PSW)

All other requirements of the PPAP are waived for this order and do not need to be completed.

The Supplier shall not ship product to BAE Systems prior to receipt of a signed/approved PSW. Product shipped in advance of PPAP approval shall be subject to rejection and may be returned at the supplier's expense.

Process or product changes require PPAP resubmission. Notification to BAE Systems prior to changes is essential, as additional audits/reviews may be required prior to resubmission; such changes are to be communicated to your BAE Systems Procurement Representative via the Vendor Information Request Form (Form 089725, replaced 097908). Process or product changes are defined as changes in the processing of the product that could affect its ability to meet design, durability, and reliability requirements, including:

- Use of a process or material other than those which were previously approved,
- Production from new or modified tools (except perishable tools), dies, molds, patterns, etc., including additional or replacement tooling,
- Production following any refurbishment or rearrangement of existing tooling or equipment,
- Production from tooling and equipment transferred from another manufacturing site,

- Change of a supplier for parts or services (e.g. heat treating, plating, welding),
- Break in production or product produced after tooling has been inactive for 24 months or more,
- Any change in material, including not only raw material but also chemical compounds or processes (i.e. paints, adhesives, sealers, lubricants, plating, heat treat processes, etc.) which become part of the finished product; this includes changing to an engineering approved alternative material or any change in the sequence of operations,
- Upon request of BAE Systems' Purchasing Representative.

The data shall be submitted and approved prior to shipment of the item in accordance with the Data Submission Instructions located in the Supplier Quality Assurance Manual (SQAM) paragraph 8.12 for this item.