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Revision A

GENERAL ATOMICS ELECTROMAGNETIC SYSTEMS

COMMERCIAL PROCEDURES AND REPAIRS APPLICATIONS WELDING SPECIFICATION

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GA PROJECT 09492

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REVISION HISTORY

Revision	Date	Description of Change
A	2021/09/02	Initial Release; ECN-103005.

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ACRONYMS

Acronym	Definition
ASME	American Society of Mechanical Engineers
AWS	American Welding Society
B/BO	Brazer/Brazing Operator
BPQR	Brazing Procedure Qualification Record
BPS	Brazing Procedure Specification
CDM	Configuration and Data Management
CDRL	Contract Data Requirements List
CMMT	Commitment
CMTR	Certified Material Test Report
Doc.	Document
GA	General Atomics
GA-EMS	General Atomics Electromagnetic Systems
MT	Magnetic Particle Testing
NDE	Non-Destructive Examination
NDT	Non-Destructive Testing
No.	Number
PO	Purchase Order
PQR	Procedure Qualification Record
PT	Penetrant Testing
Rev	Revision
RSPS	Response
SDR	Supplier Disposition Request
SWPS	Standard Welding Procedure Specification
WOPQR	Welding Operator Performance Qualification Record
WPQR	Welder Performance Qualification Record
WPS	Welding Procedure Specification

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GLOSSARY

Term	Description
Product	The item specified in contract to produce and/or deliver.
NDT	Non-Destructive Testing is a process that involves the inspection, testing, or evaluation of materials, components and assemblies for materials discontinuities, properties and machine problems without further impairing or destroying the part's serviceability.
NDE	Synonymous with NDT
Weld Map	A tool or format used to ensure that only specified welds are incorporated into the weldment. A weld map serves two purposes: 1) Instructs the welder which WPS to use in each joint and 2) enables the inspector to verify that the size and location of welds are compliant as well as ensure that no unspecified welds were incorporated.

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1 PURPOSE/SCOPE

This specification defines the welding requirements for General Atomics Electromagnetic Systems (GA-EMS) for non-Department of Defense or commercial applications. The requirements specified in this document shall be met when specified on the GA-EMS drawing or Purchase Order (PO).

2 APPLICABLE/REFERENCE DOCUMENTS

Table 1 and Table 2 list the applicable/reference material for this document. Refer to the General Atomics (GA) web site for the document numbers listed in Table 1. The requirements specified in the documents listed below may be modified by this specification.

Table 1. GA-EMS Documents

Doc. Number	Doc. Title
09492S00015	Commercial Non-Destructive Examination Requirements Specification
EMS-0364	Supplier Document Reuse Request
GA-EMS Supplier Quality Guide	(http://www.ga.com/quality-assurance)

Table 2. Non-GA-EMS Documents

Doc. Number	Doc. Title
ASME B31.1	Power Piping
ASME B31.3	Process Piping
ASME BPVC-IX	Boiler and Pressure Vessel Code – Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators
AWS A2.4	Standard Symbols for Welding, Brazing, and Nondestructive Examination
AWS A3.0	Standard Welding Terms and Definitions
AWS B2.2	Specification for Brazing Procedure and Performance Qualification
AWS C3.4	Specification for Torch Brazing
AWS D1.1	Structural Welding Code – Steel
AWS D1.3	Structural Welding Code – Sheet Steel
AWS D1.2	Structural Welding Code – Aluminum
AWS D1.6	Structural Welding Code – Stainless Steel
AWS D9.1	Sheet Metal Welding Code
AWS D17.1	Specification for Fusion Welding for Aerospace Applications
AWS D17.2	Specification for Resistance Welding for Aerospace Applications

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3 ROLES AND RESPONSIBILITIES AND ADDITIONAL DIRECTIONS

The supplier's procedures for performing welding and brazing processes may require written approval from GA-EMS before their use on the intended contract. In addition, a supplier may be subject to an on-site review by GA-EMS representatives to assure the supplier has the facilities, processes and documentation necessary to comply with the intended fabrication standards.

The supplier's personnel are responsible for ensuring complete implementation and compliance with the PO, relevant codes, and specified drawing requirements.

The supplier is solely responsible for complete and correct documentation, review and approval of all welding/brazing procedures, and qualification records.

3.1 Conflicts in Specified Requirements

- 1) If the supplier suspects deficiencies or conflicts with any requirements, the supplier shall provide the buyer with written notification of the deficiency or conflict.

Order of precedence:

- a) PO/Contract
- b) Engineering Drawing
- c) This document
- d) Other GA-EMS Approved process documents
- e) Weld Codes and Standards

NOTE: An approved Supplier Disposition Request (SDR) modifies the PO/Contract requirement.

3.2 Special Process Controls

- 1) Welding processes other than what is covered within the applicable welding standard/code require review and approval by GA-EMS.
- 2) Any heat treating of the welded components is not allowed without specific allowance by GA-EMS.

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4 QUALITY REQUIREMENTS

4.1 Material Control and Identification

- 1) The supplier shall ensure that materials are properly identified and supported with documentation as required by the PO and drawing.
- 2) For welding and brazing procedure qualification, all applicable documentation shall be retained by the supplier. Documentation includes, but is not limited to, material certifications, material heat treatment charts, nondestructive and destructive material test reports. These documents shall be available to GA-EMS and made available when requested.
- 3) As a minimum, welding consumables shall be controlled through the supplier's quality system procedures. Traceability requirements shall be identifiable by heat number and/or heat lot through the supplier's work order and made available when requested.

4.2 Inspection and Test Plan

- 1) As a minimum, the inspection and test plan shall provide the understanding and sequence of events for each processing operation and inspection or test point, from receipt of purchased material through shipment of finished product lifecycle.
- 2) The supplier's inspection and test plan shall be able to identify the required inspection procedure to be used for each area or point of inspection. Each processing operation along with inspection or test point shall be identified to which applicable reference documentation, process specification, and workmanship standard are required. This information may be provided in a separate document when referenced.

4.3 Non-Destructive Examination

- 1) Non-Destructive Examination (NDE) shall be performed in accordance with 09492S00015.

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5 REQUIRED DOCUMENTATION

1) The supplier shall provide, for review and approval by GA-EMS, copies of preproduction documentation within thirty (30) calendar days prior to welding.

NOTE: Preproduction requirements within the context of welding may include, but are not limited to, procedures, welder program approval, data reuse approval, weld maps, etc. unique to the order.

2) The required documentation required to be submitted to GA-EMS for review and approval is listed in Table 3 and Section 5.1.

Table 3. Weld Documentation Submissions per Order

Item	Item Name	Section Ref	Item Description	Notes
1	Procedure Qualification Record (PQR)	Section 5.1 Step 1)b)	Actual Recorded Parameter Data	Seller format, but must include/address all essential, nonessential, and supplementary essential variables specified by the applicable Code.
		Section 5.1 Steps 1)d)i–1)d)iv	Certified Material Test Report (CMTR)	Base and Filler materials
			Lab Test Results	All Code required test results must be recorded. Internal reports are acceptable if Seller has acceptable testing capabilities.
2	Weld/Braze Procedures (as applicable)	Section 5.1 Step 1)	WPS/BPS	Seller format, but must include/address all essential, nonessential, and supplementary essential variables specified by the applicable Code.
			Standard Welding Procedure Specification (SWPS)	Purchased from AWS; it is Seller's responsibility to ensure applicability.
			Prequalified WPS	Seller format, but must include/address all essential, nonessential, and supplementary essential variables specified by the applicable Code.
			Weld Schedule	Seller format, but must include/address all essential, nonessential, and supplementary essential variables specified by the applicable Code.
3	Weld/Braze Map	Section 5.1 Step 2)	Specified which WPS(s) are used on the weldment(s)	A weld map is typically already developed for the weld inspection activities to meet Code requirements.
5	As Applicable	Section 5.1 Step 4)	Document Reuse: Option 1	Submit Form EMS-0364, which is available at http://www.ga.com/quality-assurance
			Document Reuse: Option 2	
		Section 5.1 Step 5)	Repairs	Reference Supplier Quality Guide

NOTE: Items shall be submitted separately.

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5.1 Welding/Brazing Procedures

- 1) Welding Procedure Specification (WPS), Procedure Qualification Record (PQR), Brazing Procedure Specification (BPS), and Brazing Procedure Qualification Record (BPQR)

NOTE: This includes all WPSs, or BPSs used in welding or brazing components specified on the Order. Any heat treating of the welded components is not allowed without specific permission from the drawing, Order, or SDR.

- a) Creation date, revision date, and revision level (letter or number)
 - i. Revision control shall be to the welding code revision in effect when the WPS, PQR, BPS or BPQR is written, not when the PO is issued.
- b) Report all pertinent data as required by the governing welding/brazing code or standard.
- c) Conformance statements and signatures
 - i. All WPSs, PQRs, BPSs, and BPQRs shall be governed by the applicable welding code or standard certification statement and signature requirements.
- d) All PQRs or BPQRs, supporting the WPSs or BPSs qualified after January 1, 2017 shall include the following:

All supporting documentation for the PQR and BPQR

- i. Inspection reports (e.g., visual, radiographic, ultrasonic, magnetic particle, penetrant inspections)
- ii. Original records/reports of test results in conformance with the applicable code or specification (i.e., actual laboratory report, not transcription of data)
- iii. Laboratory test result reports shall include (when required) tensile tests, bend tests, hardness tests, chemical analysis, Non-destructive tests, or other tests required by the applicable Code or Standard.
- iv. Material certification for the following:
 - Test plate/pipe base material
 - To include heat-treat certification and furnace chart for any heat treating performed
 - Base material heat lot traceability
 - (i) Mill certification report
 - Filler material certification report
- e) Heat-treat certification and furnace chart for any heat treating performed.
- f) If there are any special qualification conditions, Supplier shall clearly describe these circumstances on the welding or brazing documents.

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- 2) Weld/Braze map identifying the WPS or BPS to be used to weld or braze each specific joint on the drawing supplied by the Buyer.
 - a) The WPS or BPS identification shall be shown in a contrasting color text (e.g., red WPS identification text on a black line/text drawing) next to the weld/braze symbol on the drawing supplied by Buyer.
- 3) Welder Performance Qualification Record (WPQR), Welding Operator Performance Qualification Record (WOPQR) and Brazer/Brazing Operator (B/BO) Performance Qualification for all welders/welding operators and brazers/brazing operators performing welding or brazing on product specified in the PO:
 - a) The following WPQR, WOPQR, and B/BO Performance Qualification documentation shall be maintained, but not submitted, in accordance with the contractual document archiving requirements and are subject to review upon request:
 - i. All supporting documentation for the WPQR, WOPQR, and B/BO Performance Qualification
 - ii. Inspection reports (e.g., visual, radiographic, ultrasonic, magnetic particle, penetrant inspections)
 - iii. Laboratory test result reports for tensile tests, bend tests, hardness tests, chemical analysis, etc. (actual laboratory reports, not transcription of data)
 - iv. Material certification for the following:
 - Test plate/pipe base material
 - To include heat-treat certification and furnace chart for any heat treating performed
 - Filler material
 - v. Conformance statement and signatures in accordance with the applicable welding code(s).

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4) Document Reuse Requirements:

- a) If Seller would like to use previously approved welding and/or brazing procedures for new Buyer Orders specifying parts with similar raw materials/thicknesses and similar weld/braze specifications/codes, Seller must notify GA-EMS Configuration and Data Management (CDM) by submitting EMS-0364 with their intent to reuse previously approved weld documentation and notify Buyer's Authorized Purchasing Representative specified in the Order concurrently.
- b) Seller is still required to submit new or revised documentation for Buyer's review. If any procedures or documentation is revised, then it needs to be submitted for review and approval prior to being used.
- c) Weld maps are required to exercise Document Reuse Option 2 and must be submitted with the request.

NOTE: Seller shall ensure the Drawing/Contract welding requirements for the new order are satisfied with the data re-use request.

5) Repairs for Weld/Braze Nonconformance

If no provisions for the repair of weld defects are made in the applicable Code, the following requirements apply.

Weld repair procedures shall be written as detailed instructions and as a minimum shall include the following:

- a) Method of removal of weld or base metal defect
- b) Method used to ensure defect removal (e.g., Magnetic particle Testing [MT] or Penetrant Testing [PT])
- c) Method for the re-welding/brazing, using qualified welders/brazers with an approved WPS or BPS (if different from the original)
- d) Extent, location, and depth of the excavation shall be documented on an inspection report

The re-welded/brazed area shall be re-examined and documented by the methods used for the examination of the original weld or alternate method approved by GA-EMS.



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