

GENERAL ATOMICS ELECTROMAGNETIC SYSTEMS

SPECIAL PROCESSES COATINGS AND CHEMICAL CONVERSION OBJECTIVE QUALITY EVIDENCE REQUIREMENTS SPECIFICATION

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REVISION HISTORY

Revision	Date	Description of Change
A	2024/03/13	Initial Release; ECN-115693.

POINT OF CONTACT

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ACRONYMS

Acronym	Definition
ALRE	Aircraft Launch and Recovery Equipment
CARC	Chemical Agent Resistant Coating
CDRL	Contract Data Requirements List
CMMT	Commitment
Doc.	Document
EAR	Export Administration Regulations
ECN	Engineering Change Notice
GA	General Atomics
GA-EMS	General Atomics Electromagnetic Systems
ITAR	International Traffic in Arms Regulations
MIL-SPEC	Military Specification
MPR	Material and Process Requirement
No.	Number
OQE	Objective Quality Evidence
PCD	Process Control Document
PDS	Product Data Sheets
PO	Purchase Order
QA	Quality Assurance
QC	Quality Clause
QCM	Quality Clause Matrix
QPD	Qualified Product Database (equivalent to Qualified Product List)
Rev	Revision
Reqt	Requirement
RSPS	Response
Spec	Specification
SSPC	Society for Protective Coatings
TSC	Thermal Spray Coatings

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1 INTRODUCTION

This General Atomics Electromagnetic Systems (GA-EMS) document provides the deliverable Objective Quality Evidence (OQE) requirements to be submitted to GA-EMS (Buyer) for review and approval prior to shipping by the Seller or sellers sub-tier supplier.

The Seller or sellers sub-tier supplier are responsible for the performance of all inspection requirements (examinations and tests) and/or collecting OQE as specified in any and all specification or standard as applicable in the Order. Unless otherwise specified in the Order, inspection results that demonstrate compliance of the part to the process specification as defined in Table 1, shall be documented, collected, and submitted to the Buyer per 49200P00002.

2 PURPOSE AND SCOPE

This specification provides additional clarification of the OQE requirements to be provided to the Buyer when Quality Clause (QC) 277a (Reference 09492L00008 – GA-EMS Standard QCs) as listed in the Purchase Order (PO), contract, or Quality Clause Matrix (QCM).

Table 1. Specifications

Special Process Standard	Special Process Description
ASTM A380	Standard Practice for Cleaning, Descaling, and Passivation of Stainless-Steel Parts, Equipment, and Systems
ASTM A967	Chemical Passivation Treatments for Stainless-Steel Parts
ASTM B633	Electrodeposited Coatings of Zinc on Iron and Steel
AWS C.23M/C2.23	Specification for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel
MIL-DTL-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-DTL-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-DTL-53072	Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection
MIL-PRF-8625	Anodic Coatings for Aluminum and Aluminum Alloys
MPR 1221	Material & Process Requirements (MPR) Coating System for Aircraft Launch and Recovery Equipment (ALRE)
MPR 1222	Material & Process Requirements (MPR) Application of Thermal-Sprayed Aluminum Corrosion Protection System
MPR 1223	Material & Process Requirements (MPR) Abrasive Blast Preparation of Steel Surfaces
MPR 1233	Material & Process Requirements (MPR) Abrasive Blast Preparation of Aluminum Surfaces
TT-C-490	Chemical Conversion Coatings and Pretreatments for Metallic Substrates

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3 APPLICABLE/REFERENCE DOCUMENTS

The documents listed in Table 2 and Table 3 form a part of this specification. While every effort has been made to ensure the completeness of Table 1, Seller or sellers sub-tier supplier are required to meet all applicable requirements of this specification whether or not they are listed in this document. For the latest revision of GA-EMS documents see the Buyer's Quality Assurance (QA) Supplier portal. In the event the document is not available via the portal, contact the Buyer. Military Specifications (MIL-SPECs) can be found on the Assist Quick Search Website:

<https://quicksearch.dla.mil/qsSearch.aspx>

Table 2. GA-EMS Reference Documents

Doc. Number	Doc. Title
09492L00008	GA-EMS Standard Quality Clauses
49200P00002	Deliverable Documentation/Data Item Submittal Instructions

Table 3. Non-GA-EMS Reference Documents

Doc. Number	Doc. Title
SAE-AMS-STD-595	Colors Used in Government Procurement
ASTM D4285	Standard Test Method for Indicating Oil or Water in Compressed Air
ASTM D4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Clean Steel
SSPC-PA2	Paint Application Specification Number 2, Measurement of Dry Paint Thickness with Magnetic Gages
SSPC-SP1	Solvent Cleaning Surface Preparation Specification No. 1
SSPC-SP10	Near-White Blast Cleaning, Surface Preparation Specification No. 10
SSPC-SP5	White Metal Blast Cleaning , Surface Preparation Specification No. 5

4 SPECIAL PROCESS COATING AND CHEMICAL CONVERSION OBJECTIVE EVIDENCE REQUIREMENTS

4.1 MIL-SPEC Coating Material

A Certificate of Analysis (QC 255a) is required for all MIL-SPEC coating material and must include all paint/coating identified by the MIL-SPEC number. The listing of products qualified to this specification are found in the Qualified Products Database (QPD) on the Assist Quick Search Website at the time the PO is acknowledged:

<https://quicksearch.dla.mil/qsSearch.aspx>

Examples include but are not limited to: MIL-DTL, MIL-PRF, etc. coatings.

MIL-SPEC OQE Certificate of Analysis to be submitted to the Buyer per QC 255a.

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4.2 ASTM A380 Standard Practice for Cleaning, Descaling, and Passivation of Stainless-Steel Parts, Equipment, and Systems

ASTM A380 covers recommendations and precautions for cleaning, descaling, and passivating of new stainless-steel parts, assemblies, equipment, and installed systems. These recommendations are presented as procedures for guidance when it is recognized that for a particular service it is desired to remove surface contaminants that may impair the normal corrosion resistance or result in the later contamination of the particular stainless-steel grade, or cause product contamination. For certain exceptional applications see ASTM A967, Chemical Passivation Treatments for Stainless Steel.

The ASTM A380 OQE Certificate of Conformance (QC 255) shall include and reference required testing to ASTM A967 standard to the following:

- Identify passivation treatment (Nitric, Citric, or other Chemical Solutions).
- Identify post cleaning treatment (if applicable).
- Workmanship – part(s) shall exhibit a chemically clean surface and shall on a visual inspection show no etching, pitting, or frosting resulting from the passivation procedures.
- Record specific two tests performed to verify effectiveness of passivation (Test Practice A, B, C, D, E, F, or G).
- Concentration, temperature, and time of passivation solution shall be available upon request.

4.3 ASTM B633 Electrodeposited Coatings of Zinc on Iron and Steel

ASTM B633 covers material and process requirements for electrodeposited zinc coatings applied to iron or steel articles to protect them from corrosion.

The ASTM B633 OQE Certificate of Conformance (QC 255) shall include a reference to the following:

- Thickness
- Adhesion
- Luster – visual examination
- Workmanship – visual examination
- Corrosion resistance – zinc coatings with Types II, III, V, and VI treatments shall show neither corrosion products of zinc nor basis metal corrosion products at the end of the test periods.

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4.4 MIL-DTL-5541 Chemical Conversion Coatings on Aluminum and Aluminum Alloys

MIL-DTL-5541 covers chemical conversion coatings formed by the reaction of chemical conversion materials with the surfaces of aluminum and aluminum alloys.

MIL-DTL-5541 OQE Certificate of Conformance (QC 255) shall include the following:

- Visual lot and/or part examination – each lot or part shall be inspected to ensure that all conversion coated items of the same type, class, form, and method, treated under the same process conditions, and submitted for acceptance at one time. Unless otherwise specified on the contract or order, the lot size shall not exceed the number of parts, articles, items, or components resulting from one day's production.
- Corrosion resistance
- Adhesion

4.5 MIL-DTL-81706 Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys

MIL-DTL-81706 covers chemical conversion materials used in formation of coatings by the reaction of material with the surfaces of aluminum and aluminum alloys.

MIL-DTL-81706 OQE Certificate of Conformance (QC 255) shall include the following:

- Conformance inspections of tests indicated in MIL-DTL-81706 tables
 - Corrosion resistance
 - Paint adhesion
 - Coating weight
 - Vertical adherence (forms IV and V only)
- If applicable, coatings applied per Manufacturers Product Data Sheets (PDS). Include surface preparation requirements, immersion requirements, environmental readings, surface temperature readings, surface profile readings, dry film thickness readings, and cure times.

4.6 MIL-PRF-8625 Anodic Coatings for Aluminum and Aluminum Alloys

NOTE: Anodic coating certifications shall be accompanied by Process Control Document (PCD) in accordance with MIL-PRF-8625.

NOTE: The supplier shall develop, maintain, and adhere to a PCD describing the anodizing process and procedures used to meet the requirements of Government specifications.

MIL-PRF-8625 OQE Certificate of Conformance (QC 255) shall include the following:

- Process control document
- Solution analysis

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- Process control tests
 - Coating weight
 - Coating thickness
 - Corrosion resistance
 - Light fastness
 - Abrasion resistance
- Frequency of process control tests
- Adhesion
- Process control test specimens (as specified in the Order)

4.7 TT-C-490 Chemical Conversion Coatings and Pretreatments for Metallic Substrates (Base for Organic Coatings)

TT-C-490 covers processes, pretreatments, and pre-primer surface preparations of metallic substrates for coating applicators. It covers metal surface preparation for delaying corrosion initiation and promoting primer adhesion. The Seller or sellers sub-tier supplier shall meet all requirements unless directed otherwise by Order.

Processing procedures per this specification to be available for review and approval by GA-EMS Buyers QA representative prior to processing each Order.

TT-C-490 OQE Certificate of Conformance (QC 255), Chemical Agent Resistant Coating (CARC), shall include the following:

- Surface cleanliness
- Water break test and conductivity
- Environmental readings
- Process control test specimens (as specified in the Order)
- If applicable, metal-rich coatings shall include cleaning and surface profile verified in accordance with SSPC-SP 5/NACE No. 1, SSPC-SP 10/NACE No. 2 or manufacturer's recommendations.
- Final rinse (Types I, II, and V)
- Thickness
- Adhesion test of CARC and non-CARC
- Accelerated corrosion resistance

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4.8 MIL-DTL-53072 CARC System Application Procedures and Quality Control Inspection

MIL-DTL-53072 covers the requirements for application of the CARC systems used on military equipment. The application of CARC systems consist of four distinct steps. Each step is critical to the performance of the overall system.

The steps are as follows:

- 1) Cleaning
- 2) Pretreating
- 3) Priming
- 4) Top Coating.

All the coatings in the CARC system are Qualified Product Database (QPD) items (reference para 4.1). The choice of the coating system belongs to the government and MIL-DTL-53072 is not intended to allow users to circumvent the system specified in the system requirements. MIL-DTL-53072 does not alleviate the requirements under other individual MIL-SPECs within document for cleaning, pretreating, or coating specifications.

CAUTION: Missing a step in the application of the CARC system can result in the failure of an entire coating system.

MIL-DTL-53072 OQE Certificate of Conformance (QC 255) shall include the following:

- Thickness
- Adhesion
- Process control test specimens (as specified in the Order)
- Water break test
- Surface cleanliness
- Workmanship – visual examination

4.9 MPR 1221 Coating Systems for Aircraft Launch and Recovery Equipment

MPR 1221 provides coating system requirements for Aircraft Launch and Recovery Equipment and related components. These coatings provide corrosion protection from the aggressive marine service environment.

MPR 1221 OQE Certificate of Conformance (QC 255) shall include the following:

- Surface profile
- Dry film thickness

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The following MPR 1221 actual test results shall be recorded and submitted to the Buyer upon written request:

- Surface cleanliness
- Proof that all coating operations began within 4 hours following abrasive blasting.
- Coating manufacture requirements
 - Mixing requirements
 - Induction time
 - Start and stop time of each coat in accordance with recoat window
 - Force cure start/stop time and temperature
- Coating Inspection OQE
 - Workmanship – visual examination
 - Adhesion
 - Proper cure – This shall include environmental condition readings (Air Temperature, Relative Humidity, Dew Point, and Surface Temperature) throughout coating system application. At a minimum, an environmental reading shall be taken and recorded at the start of each coating application.
 - Coating color

4.10 MPR 1222 Application of Thermal-Sprayed Aluminum Corrosion Protection System

MPR 1222 gives detailed requirements for the application of a corrosion protection system to steel. The system consists of blast preparation, thermal-sprayed aluminum 0.003” or 0.006” thick, (“Thickness A” or “Thickness B”), and silicone-aluminum sealer approximately 0.0001” thick. It provides good corrosion protection in marine environments up to 900 °F.

MPR 1222 OQE Certificate of Conformance (QC 255) shall include the following:

- Surface profile
- Dry film thickness

The following MPR 1222 actual test results shall be recorded and submitted to the Buyer upon written request:

- Blast preparation – see MPR 1223 for requirements (Section 4.11)
 - Surface cleanliness
 - Proof that all coating operations began within 4 hours following abrasive blasting
 - Ambient conditions during abrasive blast cleaning and coating operations
 - Compressed air cleanliness

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- Coating inspection OQE
 - Workmanship – visual examination
 - Start and stop times
 - Adhesion

4.11 MPR 1223 Abrasive Blast Preparation of Steel Surfaces

Material and Process Requirement (MPR) covers procedures and inspections for abrasive blasting steel surfaces.

MPR 1223 OQE Certificate of Conformance (QC 255) shall include the following:

- Surface profile

The following MPR 1223 actual test results shall be recorded and submitted to the Buyer upon written request:

- Surface cleanliness
- Ambient conditions during abrasive blast
- Compressed air cleanliness
- Proof that all coating operations began within 4 hours following abrasive blasting

4.12 MPR 1233 Abrasive Blast of Aluminum Surfaces

MPR 1233 provides procedures and requirements for abrasive blast surface preparation of aluminum surfaces. Abrasive blasting provides the optimum surface preparation to ensure adhesion of organic and many metallic coatings.

MPR 1233 OQE Certificate of Conformance (QC 255) shall include the following:

- Surface profile

The following MPR 1233 actual test results shall be recorded and submitted to the Buyer upon written request:

- Surface cleanliness
- Ambient conditions during abrasive blast
- Compressed air cleanliness
- Proof that all coating operations began within 4 hours following abrasive blasting

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4.13 AWS C2.23M/C2.23 Specification for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel

The procedure for application of Thermal Spray Coatings (TSCs) for the corrosion protection of steel includes: (1) surface preparation of the substrate, (2) application of the TSC, and (3) when specified, application of a sealer or of a sealer and topcoat. The procedure includes the use of suitable equipment for abrasive blasting, thermal spraying, sealing/top coating and in process QC checkpoints.

AWS C.23M/C2.23 OQE Certificate of Conformance (QC 255) shall include the following:

- Surface profile
- Dry film thickness

The following MPR 1233 actual test results shall be recorded and submitted to the Buyer upon written request:

- TSC equipment operator application qualifications
- Job reference standard acceptance
- Ambient conditions during abrasive blast, TSC application, and coating application
- Compressed air cleanliness
- Surface cleanliness
- Surface preparation SSPC-SP 5 (immersion service) SSPC-SP 10 (other service applications)
- Water soluble contamination
- Inspection of applied TSC
- Adhesion

4.14 Miscellaneous Specification

The intent of this miscellaneous specification category is to identify the minimum OQE requirements when the applicable specifications are not listed in Table 1. The Seller or sellers sub-tier supplier are responsible to comply with all applicable specification requirements, (e.g., testing, cleanliness, adhesion, thickness, etc.). Inspection results that demonstrate compliance of the part to the applicable process specification shall be documented, collected, and submitted to the Buyer per 49200P00002. At a minimum, a Certificate of Conformance (QC 255) shall be provided to the Buyer by the seller or sellers sub-tier supplier with each lot.

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