SECTION 11 5311.19

CHEMICAL RESISTANT COATINGS FOR GLOVEBOXES

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LANL MASTER SPECIFICATION SECTION

Word file at <https://engstandards.lanl.gov/specs.shtml>

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| --- |
| Rev. 3 Summary of ChangesUpdated references and other minor changes. |

The organization modifying the Section must apply a graded approach to quality assurance based on the management level designation of the project.

When this Section is used with nuclear facilities subject to 10 CFR 830, modification to this Section must be performed by an individual or organization operating under a quality assurance program that meets the requirements of that CFR. When it is not, reference to NQA-1 and 10CFR830 may not be appropriate.

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Edit this template for each project. In doing so, Specifier must add job-specific requirements.

Brackets are used in the text to indicate where text must be supplied by the Specifier. Once the choice is made or text supplied, remove the brackets. The Section must also be edited to delete requirements for materials, systems, processes, items, or designs that are not included in the Project-- and Specifier's notes such as these. To seek a variance from requirements that are applicable, contact the Engineering Standards Manual (ESM) Architectural [POC](https://engstandards.lanl.gov/POCs.shtml#arch). Please contact POC with suggestions for improvement as well.

When assembling a specification package, include applicable Sections from all Divisions, especially Division 1, General requirements.

This Section developed for ML-4 applications.  For ML-1, 2, and 3 applications, additional requirements and independent reviews should be added if increased confidence in procurement or execution is desired; see ESM Chapter 1 Section Z10 Quality section and Sections attachment.

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## SECTION INCLUDES

### Requirements for the control, application, testing and quality assurance of chemical-resistant coatings for gloveboxes and enclosures to be used for the confinement of special nuclear materials and hazardous chemicals.

### The fabrication and assembly of gloveboxes and enclosures is not included; however, the glovebox assembly drawings dictate which gloveboxes are required to be coated and the material of construction (e.g., 304L or 316L stainless steel).

### Performance of tests and inspections required by this Section.

### Repackaging, shipment, and delivery of gloveboxes after coating application and acceptance.

## related sections

### 01 2500 *Substitution Procedures*

### 01 3300 *Submittal Procedures*

### 01 4000 *Quality Requirements*

### Section 01 8113.13 [LEED v4 and]Guiding Principles 2020: Requirements for water efficiency, energy efficiency, material composition, and indoor air quality requirements

### 01 4200 *References*

### \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### Include the following Sections as required for the specific project requirements.

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### 11 5311.08, *Glovebox Design*

### 11 5311.10, *Glovebox Fabrication*

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Verify the following Drawings with the Project Engineer. Edit list as required.

### Drawings

1. Drawing [XXXXX] Fire Detector Housing
2. Drawing [XXXXX] Bolted Window
3. Drawing [XXXXX] Bolted Service Panel
4. Drawing [XXXXX] Shelf
5. Drawing [XXXXX] Lattice Support
6. Drawing [XXXXX] Introductory Tube
7. Drawing [XXXXX] Transfer Door
8. Drawing [XXXXX] Push-Through HEPA Filter
9. Drawing [XXXXX] Open Front Box Filter
10. Drawing [XXXXX] Stainless Steel Cup Sink

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## REFERENCE DOCUMENTS

### Related standards, Sections, manuals, codes, and other publications of nationally recognized organizations are referenced herein. Methods, equipment and materials must comply with applicable or specified portions of the referenced documents, in addition to federal, state, or local codes having jurisdiction.

### Codes, Sections, and standards referred to by number or title must form a part of this Section to the extent required by the references thereto:

1. [American Society of Mechanical Engineers (ASME)
	1. ASME NQA-1-2008, Quality Assurance Requirements for Nuclear Facility Applications.]
2. ASTM International (formerly American Society for Testing and Materials)
	1. ASTM B244: Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.
	2. ASTM D4285: Standard Test Method for Indicating Oil or Water in Compressed Air.
	3. ASTM G62: Standard Test Method for Holiday Detection in Pipeline Coatings.
3. Department of Energy (DOE)
	1. [10 CFR 830.122, Quality Assurance Criteria]
	2. DOE O 414.1D, Quality Assurance

## DEFINITIONS AND ACRONYMS

1. Certificate of Conformance: A document signed or otherwise authenticated by an authorized individual certifying the degree to which items or services meet specified requirements.
2. DC: Direct Current
3. DFT: Dry Film Thickness
4. Enclosure: For this Section, open front boxes, transfer boxes, and hoods which are included by the term “glovebox.”
5. End Panel: A removable and reseal able panel used for interior access.
6. Glovebox: A controlled environment enclosure providing confinement from the work area. Operations are performed through sealed glove openings for the protection of the worker, the environment and/or the process. Confinement is defined as a physical and environmental barrier separating the interior and the exterior of the glovebox for operations conducted inside. For this Section, also includes enclosures.
7. Introductory Tubes: An appurtenance used to allow passage of an object through the glovebox boundary.
8. LANL: Los Alamos National Laboratory
9. Open front box: An enclosure similar to a glovebox except that the gloves and the small window between the gloveports are replaced by an open slot across the front allowing greater access into the enclosure. The larger window above the slot is either stationary or mounted in a hinged upper door. Hazardous material confinement is achieved by means of continuous airflow into the slot.
10. Service Panel: A removable and resealable panel used for interior access of utility services.
11. Subcontract Technical Representative (STR): Primary LANL contact point for purchase order activities
12. Subcontractor: Entity furnishing items or services in accordance with a procurement document. An all-inclusive term used in place of any of the following: supplier, vendor, seller, fabricator, consultant, and their sub-tier levels.

## ACTION SUBMITTALS FOR LANL APPROVAL

1. Product Data: Manufacturer’s technical data for specified coating.
2. Installation Instructions: Manufacturer's literature indicating installation Sections and procedures for specified coating
3. Procedures: As listed under Para 1.9 Quality Assurance and Quality Control.
4. Material Certifications: As listed under paragraph 1.9 Quality Assurance and Quality Control.
5. Samples: Three sample coupons that have been coated per this Section. The coupons must be 6" x 6" and constructed of 7-gauge 304L stainless steel. One side of the coupon must be coated with specified coating and the other side masked or polished to match original finish.

## INFORMATIONAL SUBMITTALS

1. As listed under paragraph 1.9 Quality Assurance and Quality Control:
	* + 1. Personnel certifications
			2. Test reports
			3. Inspection reports
			4. Dimensional inspection reports
			5. Supplier certifications
2. Certificate of Conformance: A certificate of conformance must be provided and signed by the Subcontractor. This certificate must state that the glovebox coatings have been applied and tested in accordance with this Section and, if applicable, the Subcontract documents and that the final product fully complies with all technical requirements of the Subcontract.

## SUSTAINABLE DESIGN SUBMITTALS

1. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.

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Edit material certifications list to suit products specified in this section and Project sustainable design requirements. Specific certificate submittal and supporting data requirements are specified in Section 01 8113.13.

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1. Materials Resources Certificates:
2. Certify recycled material content for recycled content products.
3. Certify source for regional materials and distance from Project site.
4. Product Data: For coating and primer, documentation including printed statement of VOC content.
5. Laboratory Test Reports: For coating and primer, documentation indicating that products comply with testing and product requirements of 40 CFR 59, Subpart D (EPA Method 24) National Volatile Organic Chemical Emission Standards for Architectural Coatings, if met.

## CLOSEOUT SUBMITTALS

1. Shop Traveler: Completed document as listed under paragraph 1.9 Quality Assurance and Quality Control.
2. Quality Assurance Document Package: As listed under paragraph 1.9 Quality Assurance and Quality Control.

## QUALITY ASSURANCE AND QUALITY CONTROL

1. Subcontractor is responsible for the application of chemical-resistant coatings to gloveboxes in strict accordance with this Section, Subcontract Drawings (if applicable), and the LANL-approved Subcontractor application procedure.
2. The application process, which includes but is not limited to procurement of material, surface preparation, coating application, curing, and testing and inspection must be performed in strict compliance with Subcontractor’s application procedure. The application procedure as well as sample material submittals (e.g., approved test coupons) will serve as the basis for acceptance or rejection of glovebox coatings including finished color. In the event of a conflict between this Section and the application procedure, the Subcontractor must notify the LANL Subcontract Technical Representative (STR) immediately and request further instruction.
3. Subcontractor must provide LANL full access to the facility for the purpose of performing random or scheduled inspections and/or surveillance of work being performed.
4. Subcontractor must provide a coating schedule as required in the purchase order documents showing all steps, hold and witness points, and tests and inspections.
5. Work performed must be in accordance with a Quality Assurance Program meeting the requirements of DOE O 414.1D, Quality Assurance, [and 10 CFR 830.122, Quality Assurance Criteria, through implementation of the applicable requirements of ASME NQA-1-2008, Quality Assurance Requirements for Nuclear Facility Applications (parts I and II)], which has been approved by LANL as specified in Section 01 4000, Quality Requirements. Additional detailed Quality Assurance requirements are provided in specific equipment Section sections as required.
6. Subcontractor must provide a lower tier services plan that includes the name, address, telephone number and point of contact for all outside services that Subcontractor intends to use to perform any portion of the work required by this Section. This plan must identify the work requirements of this Section that will be performed by those outside services. Subcontractor must submit this plan in accordance with this Section. Lower-tier Subcontractors must meet all requirements dictated within this Section.
7. Procedures: Maintain administrative, coating, inspection, and testing procedures in accordance with the approved QA Program and meeting the requirements of this Section. The following procedures/content is required:
8. Material Control Procedure: Describe the coating methods and traceability documentation to handle and monitor the use of controlled material such as coating, surface preparation, and priming materials.
9. Shop Traveler Procedure: Describe the method for the control and use of a shop traveler system to impart and convey the technical requirements of this Section and, if applicable, the Subcontract drawings into specific work instructions which define the coating and inspection sequence and identify hold and witness points.
	1. The shop traveler must include each of the sequential coating and inspection steps and make provision for initials of operators and inspectors and dates of accomplishment to denote completion of each step prior to initiation of the next step.
	2. Include the proposed job-specific shop traveler to be used.
10. Application Procedure: Describe the preparation, materials, application, and controls to be used to apply the coating system to the stainless steel substrate. The procedure must also include sufficient sketches to describe which surfaces will be coated. The sketches must focus on areas of interest such as glovebox openings and gasket seal areas.
11. Dry Film Thickness (DFT) Test Procedure: Describe the methods, materials, controls, and inspections to be used for testing the dry thickness of the coating system. Procedure must meet the requirements of ASTM B244.
12. Bond and Adhesion Test Procedure: Describe the testing of coating adhesion to all coated surfaces. Must describe the methods, materials, controls and equipment used to accomplish this test.
13. Spark Test Procedure: Describe the methods, materials, controls and inspections used to accomplish the spark test for all coated surfaces. Must meet the requirements of ASTM G62.
14. Repair Procedures: Those necessary to repair defects in the coating system revealed by visual inspections and shop tests.
15. Calibration Procedure: Describe any calibration performed, and documentation thereof, on measuring and test equipment to be used on this operation.
16. Surface Finish Inspection Procedure: Describe the methods and acceptance criteria for examining the coating surface finish, as well as the uncoated metal surfaces.
17. Dimensional Inspection Procedure: Describe the methods for examining the equipment to determine if deformations have occurred due to the coating process.
18. Weld Stud Application Procedure: Describe to LANL the method for protecting the coating while attaching weld studs on the opposite side of the coated surface in the field.
19. Personnel Certifications: Submit the following for each person assigned to glovebox coating operations, including sandblasting, priming, coating, testing, inspection, and witnessing are fully qualified to perform their respective job functions:
	1. Coating performance certification records.
	2. Testing, inspection, and witnessing personnel certifications.
20. Test Reports: Test each glovebox and submit the following:
	1. For all test types below:
		1. Glovebox or enclosure identification
		2. Date of test
		3. Make, model, and description of test equipment
		4. Calibration date of test equipment and next calibration due date
		5. Name and signature of the certified test operator
		6. Name and signature of test witnesses
	2. Bond and Adhesion Test Reports: The following additional information:
		1. Bond test results, parameters, and acceptance requirements
	3. Spark Test Reports: The following additional information:
		1. Location and description of indications
		2. Description of repairs and retest
	4. DFT Test Reports: The following additional information:
		1. Panel mark number (if applicable)
		2. Location of test sites on panel
		3. Description of repairs
		4. Final film thickness at each test location
		5. Coating film thickness map indicating locations of coatings less than 40 mil and greater than 65 mils and the actual value
21. Inspection Reports: Inspect and document each glovebox coating operation and submit as follows:
	1. Dimensional Inspection Report: Create after coating and curing are completed. Document flatness around openings and on all sealing surfaces only for the purpose of determining if the coating process has deformed the glovebox shell. The coating Subcontractor is not expected or allowed to correct any dimensional deficiencies discovered in this inspection. Inform LANL STR of any negative findings and await direction. Include the following information:
		1. Glovebox or enclosure identification
		2. Date of test
		3. Name and signature of the certified inspector
		4. Location and description of out of tolerance dimensions
		5. Name and signature of inspection witnesses
	2. Surface Finish Inspection Report: Include the same information as Dimensional Inspection Report above, along with:
		1. Make and model of inspection equipment
		2. Calibration Date of test equipment and next calibration due date
		3. Location and description of indications (versus dimensions)
		4. Description of any repairs and re-inspection
22. Material Certifications
	1. Provide prior to coating for all materials to be used in coating applications.
	2. Also provide with the quality assurance documentation package closeout submittal described below.
	3. Provide Material Safety Data Sheets (MSDS) for all materials used in the priming and coating process.
23. Shop Traveler
	1. After work is finished, submit the completed shop traveler form as part of the QA Document Package.
24. Quality Assurance Documentation Package: Ensure that documented evidence of the requirements herein are maintained throughout the fabrication process and submit at closeout. As a minimum, the package must include copies of the following and be organized as follows:
25. SECTION A - CONTRACTUAL DATA
	1. Certificate of conformance
	2. Subcontract provisions
	3. Approved Supplier Deviation Disposition Requests (SDDRs)
26. SECTION B - TEST AND INSPECTION REPORTS
	1. Shop Traveler
	2. Dry Film Thickness Test Reports
	3. Spark Test Reports
	4. Surface Finish Inspection Reports
	5. Dimensional Inspection Reports
	6. Bond and Adhesion Test Reports
27. SECTION C - MATERIAL CERTIFICATIONS
	1. Coating Agent Material Certifications
	2. Material Safety Data Sheets (MSDS)
28. Supplier Certification: Showing verifiable successful history of at least five years in performing fluoropolymer thermoplastic coating required by this Section.

## DELIVERY, HANDLING, AND STORAGE

## Packaging, shipping, receiving, storage, and handling must be in accordance with the Subcontractor’s quality assurance program and as specified below.

## Gloveboxes to be coated will be shipped to Subcontractor either assembled or disassembled. Upon receipt of gloveboxes at the Subcontractor’s facility, crates containing the gloveboxes must remain unopened.

## Immediately inform the STR of receipt and request further disposition instruction to allow LANL the opportunity to be present for the receiving inspection to ensure the items have arrived free of damage or defects.

## Unpack the items and retain the crates, packing materials and all enclosed documentation.

## Should lifting frames, slings or other special lifting apparatus be required, the proposed methods and devices require prior approval from LANL STR.

## Packaging Preparation

1. Do not perform packaging and shipping of glovebox until shop acceptance testing and inspection have been completed and the results approved by LANL. Glovebox coatings that pass inspection and acceptance testing and meet the requirements of this Section will be approved for shipment. Ensure that all original documentation has been replaced into the crates prior to shipment. Provide a minimum of seven working days advance notice prior to packaging and crating for shipment to LANL.
2. Components must be prepared and packaged to prevent damage during shipping and handling. Particular care must be used to ensure that the coatings, surface finishes, cleanliness, dimensional stability and overall integrity of the glovebox is not affected during shipment. Glovebox openings must be sealed with temporary covers or other protection to exclude dirt and prevent damage to openings of nozzles or sealing surfaces of gasketed openings.
3. Install service panels or access panels and other bolted confinement structures loosely on the openings or ship separately. Seal openings with temporary covers or other protection to exclude dirt and prevent damage to openings of fittings or sealing surfaces of gasketed openings. Protect mating surfaces with clean plywood or cardboard covers. Use tape having low chloride (250 ppm maximum) content.
4. If the glovebox is fabricated at an elevation different from the elevation indicated in the site conditions section of this Section, provide for a means of pressure relief in the glovebox during shipping. An open service penetration on the glovebox with dust filter is adequate means of pressure relief. Do not totally seal the glovebox during shipping.
5. "Loose equipment" that may work loose or be lost in transit must be removed from glovebox, packaged securely and shipped separately. Mark removed assemblies with the associated glovebox number for ease of reassembly at LANL. Do not leave unsecured equipment of any type inside a glovebox during shipment. Any openings created by equipment removal must be plugged. Examples of equipment to be removed include HEPA filter housing and service or access panels.
6. Any separate components that are part of the order must be rebagged or re-crated separately and must be marked, if necessary, to identify the glovebox with which the parts are associated.

## Packaging

1. Packaging Procedure: Submit a packaging procedure describing the methods, material control, and inspections to be used to perform glovebox packaging for shipment. Address the covering of glovebox openings, pallet and crate construction, protection of the glovebox sealing surfaces, and marking of the crate. Submit this packaging procedure for approval prior to performing glovebox packaging for shipment.
2. Pack glovebox individually in totally enclosed wooden crates with provisions for handling by a forklift. Ship glovebox as complete assembled units. Protect protrusions from damage during shipping and unpacking. If shipping limitations restrict complete glovebox assembly shipments, propose a recommended alternative for approval by LANL STR.
3. Bag or crate any separate components that are part of the order and mark accordingly to identify the glovebox with which the components are associated. Furnish packing material, weather protection, dunnage, and crating.
4. Provide desiccant bags inside glovebox to prevent condensation build-up during shipping.

## Crating

1. Crating provisions apply where the organization providing fabrication services is delivering glovebox to LANL directly and is not providing installation services.
2. Provide lumber seasoned, reasonably sound, and free from cross grain and knots that would interfere with nailing or stapling, or knots that are greater than 1/3 the width of the lumber.
3. Construct crates with outer framework consisting of upright and horizontal members and with additional diagonal upright and horizontal members where necessary to provide proper strength and rigidity.
4. Construct crates with three-way lock corners, where members will be joined with nails or staples driven into side grain of joining members. See the examples of three-way lock corners under Attachment D.
5. Use double nailing or stapling to fasten joining crate members.
6. Design and construct crates with transverse cross-members at the base sufficient in strength to protect the underside from damage by mechanical handling equipment.
7. Crate Marking: Properly and clearly mark crates on the top and four sides using a stencil. As a minimum, provide information including LANL purchase order or Subcontract number, glovebox or enclosure number, and the actual weight of the crate and its contents. Identify each crate or package as a part of the total order, for example "Crate #1 of 5”. Since the glovebox will be repackaged using the original crates and packing materials, the Supplier must ensure that any original markings that are not applicable are crossed out and new markings are applied.

## EXCEPTIONS, DEVIATIONS AND CONFLICTS

1. The Subcontractor must comply with Section 01 2500 Substitution Procedures for any proposed changes, exceptions and/or deviations to this Section or, if applicable, the Subcontract Documents. Proposed changes that affect cost or schedule must be submitted in accordance with the provisions of the Subcontract. The Subcontractor must provide this information in accordance with Section 01 2500 using the Supplier Deviation Disposition Request (SDDR) form provided as an attachment to the Section. The proposed changes, exceptions or deviations must not be implemented until LANL provides written approval by means of the SDDR form.
2. In the event of conflicts amongst the Sections, Drawings and/or the manufacturer's recommended processes or instructions, the Subcontractor must notify the LANL STR of the conflict. Notification of a conflict must be provided in written form immediately following its discovery. This request must be submitted in accordance with this Section.
3. “Or approved equal” is always implied after a brand name, patented process or catalog number. The Subcontractor may substitute any brand or process approved as an equal by LANL, who may seek guidance by the specifying A/E of Record. The only exceptions are where "no substitution" is specified. Request approval for any substitutions by submitting a Supplier Deviation Disposition Request (SDDR) to LANL, in accordance with the instructions in Section 01 2500 Substitution Procedures. Include all documentation that demonstrates the qualifications of the proposed product, such as, but not limited to, cut sheets, test reports, certifications, and drawings. Procurement of substitutions is prohibited until the SDDR is approved by LANL.

# PART 2 PRODUCTS

1. MANUFACTURERS
	1. Subject to compliance with requirements, manufacturers and/or suppliers offering products that may be incorporated in the work include, but are not limited to, the following:
		1. [Solvay Specialty Polymers]
		2. [Arkema Inc.]
		3. [<Provide manufacturer supplier>]

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Select suitable polyvinylidene fluoride (PVDF), ethylene-tetrafluoroethylene (ETFE), or ethylene-chlorotrifluoroethylene (ECTFE) coating in consultation with LANL glovebox/enclosure SME. Selection to be based on properties required for anticipated operations and processes to be used. Properties to be considered include, but are not limited to:

* Physical properties
* Chemical resistance
* Thermal properties
* Electrical properties
* Flame resistance
* Surface characteristics
* Corrosion resistance
* Other

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1. COATINGS

[A. Polyvinylidene-fluoride (PVDF), with the following characteristics:

1. Physical properties
2. Chemical resistance
3. Thermal properties
4. Electrical properties
5. Flame resistance
6. Surface characteristics
7. Corrosion resistance
8. Other as required]

[B. Ethylene-tetrafluoroethylene (ETFE)

1. Physical properties
2. Chemical resistance
3. Thermal properties
4. Electrical properties
5. Flame resistance
6. Surface characteristics
7. Corrosion resistance
8. Other as required]

[C. Ethylene-chlorotrifluoroethylene (ECTFE)

1. Physical properties
2. Chemical resistance
3. Thermal properties
4. Electrical properties
5. Flame resistance
6. Surface characteristics
7. Corrosion resistance
8. Other as required]

[D. Sustainability Characteristics

1. Recycled content [specify recycled content of product, if available]
2. VOC: [specify VOC limit product]
3. Primer: Primer material along with any other materials used in the coating process must be compatible with the coating as specified by the Manufacturer.
4. All materials used in the coating system must be new and in un-opened containers. A minimum of three months must remain before the expiration of the shelf life of the material. In no event must material be used for which the recommended shelf life has expired. All materials must be stored per the manufacturer's recommendations throughout the coating process. Approval of the material to be used must be obtained from LANL prior to commencement of the work in accordance with this Section. A sample coupon of the proposed coating must be submitted in accordance with this Section.
5. As internal glovebox visibility is of the utmost importance, the color of the finished coating must be white or as near white as possible with minimum light reflectance value (LR) of [.85]. Improper color of the finished coating will be grounds for rejection by LANL.

PART 3 EXECUTION

1. EXAMINATION
	1. Final inspection and Acceptance: Upon receipt of the shipment, Subcontractor and LANL (if required) must inspect the shipment as necessary to ensure that received items have not been damaged during shipment and that all required items and supporting documentation have been received.
2. GLOVEBOX PREPARATION
	1. Prior to coating, the glovebox must be baked above the coating baking temperature to ensure that surface flatness is maintained after baking and entrapped gas in the metal welds is removed.
3. SURFACE PREPARATION
	1. Materials used to prepare glovebox surface for coating (e.g., shot blast materials) must be free of contaminants such as sulfur, fluorides, chlorides, and carbon steel.
	2. Glovebox shells and components must be coated as described in Appendix C. All surfaces not requiring coating or surface preparation must be suitably masked and remain in their original condition or must be polished to the original finish or equivalent after coating. Refer to the Subcontract documents for additional information.
	3. Compressed air used in coating and sandblasting must be free from oil and water per ASTM D4285.
4. COATING SYSTEM APPLICATION
	1. Application of all coating system materials must be in strict accordance with the Subcontractors procedures as validated and approved by LANL.
	2. If the application procedures call for intermediate oven baking of the coated surfaces, exercise caution to prevent distortion and/or annealing of the panels.
	3. The minimum DFT for the completed system must be [minimum of 40 mils and a maximum of 65 mils] except for welded corners, convex corners, and concave radii less than [1/4”] [˂specify requirement˃] which must have a tolerance of [-25 mils/+10 mils.] [˂specify requirement˃]. The original surface finish and coloration must be maintained after the coating process either by masking the stainless steel or post-coating polishing.
	4. Polish uncoated glovebox surfaces except internal glove ring surfaces to remove discoloration due to the coating process.
5. FIELD QUALITY CONTROL
	1. FABRICATION HOLD POINTS
		1. Hold points are required during the fabrication process to allow inspection, verification, or approval by LANL before the Subcontractor does further work. Identify hold points on the shop traveler and make provision for LANL signoff. The hold points are shown in Attachment B.
	2. WITNESS POINTS
		1. For inspections or tests at the Subcontractors facility that require LANL witnessing, provide seven (7) working days advance written notification to LANL STR so that a LANL representative may be present at the Subcontractors shop to witness the activity and/or inspect results. The witness hold points are shown in Attachment B.
	3. TESTING AND INSPECTION
		1. Shop Acceptance Tests
			1. Provide all shop acceptance testing required by this Section. Provide the test location, equipment, and instrumentation of certified accuracy to fully execute the tests. Provide test personnel qualified to conduct, record, and verify test results. Submit certifications for test personnel as described in this Section. Shop acceptance tests must be witnessed by LANL representatives; provide LANL with seven (*7)* working days advance notice of shop acceptance tests.
			2. DFT Test
				1. Perform test on all accessible coated surfaces per LANL-approved procedure.
				2. Perform preliminary tests to find and fix any problems as required, prior to the formal shop acceptance test. A final test must be performed as the documented shop acceptance test, which must be witnessed by LANL.
			3. Spark Test
				1. Perform on all coated surfaces of each glovebox to detect leaks or holes per LANL-approved procedure.
				2. Perform preliminary test and repairs prior to the formal shop acceptance test. Perform final test as the documented shop acceptance test which must be witnessed by LANL.
				3. Voltage must be limited to 5,000 volts DC for coatings that are less than 30 mils.
			4. Surface Finish Inspection (both coated and uncoated surfaces)
				1. Perform surface finish inspection on all coated surfaces of the glovebox per LANL-approved procedure. Mirrors and cameras may be used to inspect areas that are not directly visible. The inspection must evaluate the finish for color, the absence of ripples, folds, discontinuities, or overlaps. In addition, inspect for scratches or surface imperfections to the uncoated stainless steel surfaces of the glovebox. Repair any surface imperfections in the coating or stainless steel per LANL-approved procedure.
			5. Dimensional Inspection
				1. Conduct after coating per LANL-approved procedure.
			6. Bond and Adhesion Test
				1. Perform on all accessible coated surfaces of each glovebox per LANL-approved procedure.
				2. Perform preliminary tests prior to the shop acceptance test. A final test must be performed as the shop acceptance test which must be witnessed by LANL.
6. SCHEDULES
	1. Attachment A – Drawing and Data Submittal Requirements
	2. Attachment B – Inspection and Testing Requirements Schedule
	3. Attachment C – Coating Schedule
	4. Attachment D – Examples of Three-way Lock Corners

END OF SECTION

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Do not delete the following reference information:

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THE FOLLOWING STATEMENT IS FOR LANL USE ONLY

This project Specification Section is based on LANL Master Specification Section 11 5311.19 Rev. 1, dated December 15, 2022.

Attachment A

Drawing and data submittal requirements

| Section No: 11 5311.19 | Type of Submittal | Submittal Schedule, Format (see notes), and Number of Copies  |
| --- | --- | --- |
| Section Title: Chemical Resistant Coatings for Gloveboxes |  |  |
| DESCRIPTION OF SUBMITTAL REQUIRED | FOR INFORMATION | FOR REVIEW, COMMENT, & APPROVAL | FOR INSPECTION & ACCEPTANCE | WITH BID | AT KICKOFF MEETING | PRIOR TO FABRICATION | Final Inspection | PRIOR TO SHIPMENT | WITH SHIPMENT | REMARKS |
| TITLE | SECTIONREFERENCE PARAGRAPH | CHECK WHEN REQUIRED NUMBER OF COPIES |
| Lower Tier Services Plan | 1.1.H |  | X |  | E[X] |  |  |  |  |  |  |
| Fabrication Schedule | 1.1.I |  | X |  | E[X] | E[X] |  |  |  |  |  |
| Quality Assurance Manual (Fabrication) | 1.9.A |  | X |  | E[X] |  |  |  |  |  |  |
| Fabrication and Quality Control (QC) Procedures (Include Rev # or Date): |  |  |  |  |  |  |  |  |  |  |  |
| Material Control Procedure | 1.9.B.1 |  | X |  |  |  | E[X] |  |  |  |  |
| Shop Traveler Procedure and traveler | 1.9.B.2 |  | X |  |  |  | E[X] |  |  |  |  |
| Application Procedure | 1.9.B.3 |  | X |  |  |  | E[X] |  |  |  |  |
| Dry Film Thickness (DFT) Test Procedure | 1.9.B.4 |  | X |  |  |  | E[X] |  |  |  |  |
| Bond and Adhesion Test Procedure | 1.9.B.5 |  | X |  |  |  | E[X] |  |  |  |  |
| Spark Test Procedure | 1.9.B.6 |  | X |  |  |  | E[X] |  |  |  |  |
| Repair Procedures | 1.9.B.7 |  | X |  |  |  | E[X] |  |  |  |  |
| Calibration Procedure | 1.9.B.8 |  | X |  |  |  | E[X] |  |  |  |  |
| Surface Finish Inspection Procedure | 1.9.B.9 |  | X |  |  |  | E[X] |  |  |  |  |
| Dimensional Inspection Procedure | 1.9.B.10 |  | X |  |  |  | E[X] |  |  |  |  |
| Weld Stud Application Procedure | 1.9.B.11 |  | X |  |  |  | E[X] |  |  |  |  |
| Personnel Qualifications: |  |  |  |  |  |  |  |  |  |  |  |
| Coating Performance Certification Records | 1.9.C.1 |  | X |  |  |  | E[X] |  |  |  |  |
| Test Personnel Certification | 1.9.C.2 |  | X |  |  |  | E[X] |  |  |  |  |
| Test Reports: |  |  |  |  |  |  |  |  |  |  |  |
| Bond and Adhesion Test Report | 1.9.D.1 |  |  | X |  |  |  |  | E[X] |  | Note 2 |
| Spark Test Report | 1.9.D.2 |  |  | X |  |  |  |  | E[X] |  | Note 2 |
| DFT Test Report | 1.9.D.3 |  |  | X |  |  |  |  | E[X] |  | Note 2 |
| Surface Finish Inspection Report | 1.9.E.1 |  |  | X |  |  |  |  | E[X] |  | Note 2 |
| Dimensional Inspection Reports | 1.9.E.2 |  |  | X |  |  | E[X] |  | E[X] |  | Note 2 |
| Sample Coupons | 1.5.E |  |  | X |  |  | D [X] |  |  |  |  |
| Material Certifications | 1.9.E |  |  |  |  |  |  |  | E[X] |  | Note 2 |
| Shop Traveler, Completed | 1.9.G |  |  | X |  |  |  |  | E[X] |  | Note 2 |
| Certificates of Conformance | 1.6.F |  | X |  |  |  |  |  | E[X] |  | Note 2 |
| Material Safety Data Sheets | 1.9.F.3 |  |  | X |  |  |  |  | E[X] |  | Note 2 |
| Supplier Deviation Disposition Request | 1.10.A |  | X |  |  |  |  |  |  |  | C[X]A/R,Note 2 |
| Lifting Procedure | 1.10.D |  | X |  |  |  | E[X]A/R |  |  |  |  |
| Notification of Conflict | 1.1.D |  | X |  |  |  |  |  |  |  | C[X]A/R |

NOTES:

1. FORMAT CODES

A – Full size prints

B – Half size prints

C – Manual (Booklet, Brochure, Report, etc.)

D – Other (Specify) Supplier’s standard form

E – Native Computer file and pdf (electronic copies)

[X] – Number of Copies

1. These documents must be submitted as part of the Quality Assurance Documentation Package.
2. ADDITIONAL TIMING CODES IN REMARKS
3. Definitions:

A/R As required

D-Days

N/A Not Applicable

W – Weeks

1. Provide within five (5) working days of a modification to the Subcontract.

Attachment B

INSPECTION AND TESTING REQUIREMENTS SCHEDULE

**General Requirements - Applicable Only If Marked Nomenclature: N** =Required, Non-Witnessed Test; **X** = LANL Inspector To Verify Documents Have Been Reviewed; and **B** =Required, LANL Witnessed Test

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Coatings |  |  | Coatings |  |  |  |  |
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|  |  |  |  | **FABRICATION INSPECTION** |  |  |  |  |  | **DOCUMENTATION REVIEW** |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | **1. BEFORE FABRICATION** |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | A) LOWER TIER SERVICES PLAN |  |  |  |  |  |  |
| **N** |  |  |  | 1. DIMENSIONAL INSPECTION |  | **X** |  |  |  | B) FABRICATION SCHEDULE |  |  |  |  |  |  |
|  |  |  |  |  (AFTER COATING) |  | **X** |  |  |  | C) MATERIAL CONTROL PROCEDURE |  |  |  |  |  |  |
| **N** |  |  |  | 2. SURFACE FINISH INSPECTION |  | **X** |  |  |  | D) SHOP TRAVELER PROCEDURE  |  |  |  |  |  |  |
| **B** |  |  |  | 3. FINAL INSPECTION AND |  | **X** |  |  |  | E) APPLICATION PROCEDURE  |  |  |  |  |  |  |
|  |  |  |  |  ACCEPTANCE |  | **X** |  |  |  | F) DFT TEST PROCEDURE  |  |  |  |  |  |  |
|  |  |  |  | **TESTING** |  | **X** |  |  |  | G) BOND AND ADHESION TEST  |  |  |  |  |  |  |
| **B** |  |  |  | 1. DFT TEST |  | **X** |  |  |  |  PROCEDURE  |  |  |  |  |  |  |
| **B** |  |  |  | 2. SPARK TEST |  | **X** |  |  |  | H) SPARK TEST PROCEDURE |  |  |  |  |  |  |
| **B** |  |  |  | 3. BOND AND ADHESION TEST |  | **X** |  |  |  | I) REPAIR PROCEDURES |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | J) CALIBRATION PROCEDURE |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | K) SURFACE FINISH INSPECTION |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  PROCEDURE |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | L) DIMENSIONAL INSPECTION |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  PROCEDURE |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | M) WELD STUD APPLICATION |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  PROCEDURE |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | N) COATING PERFORMANCE |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  CERTIFICATION RECORDS |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | O) TEST PERSONNEL CERTIFICATION |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | P) SAMPLE COUPON |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  | Q) LIFTING PROCEDURE |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  | **2. PRIOR TO SHIPMENT** |  |  |  |  |  |  |
|  |  |  |  |  |  | **X** |  |  |  |  A) QUALITY ASSURANCE |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  DOCUMENTATION PACKAGE |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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ADDITIONAL COMMENTS: Notify LANL Project Engineer and QA Manager via STR prior to reaching any of the inspection points. Under no circumstances may any equipment be shipped without the above inspections being performed, unless specifically waived in writing by LANL. Submit a certified test report to LANL within two (2) weeks after testing, whether test is witnessed or not.

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Edit Attachment C drawing numbers and details as required to coordinate with other specific project requirements, drawings, and Sections. The design agency will control the form and fit of mating surfaces after coating by providing these drawing details. Some of the surfaces that are not coated will require special consideration (i.e., be a raised surface) for ease of removing the coating in these areas.

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ATTACHMENT C

COATING SCHEDULE

C.1 Glovebox shells and components must be coated as described below:

1. Shell – The internal surfaces of the glovebox shell must be coated except for weld stud threads and end flanges. This may include the filter housings.
2. Introductory Tube (Drawing [XXXXX Sheet Q-XXXX]) - The coating must extend to the ledge of the introductory tube cutout but must not extend to the external surface of the shell. The introductory tube weldment internal to the glovebox must be coated including the sealing surface but excluding the pipe threads. The internal cap must not be coated. Introductory tube details are shown below.



1. Fire Detector Housing (Drawing [XXXXX Sheet Q-XXXX]) – The fire detector housing must not be coated.
2. End Panels – The internal surfaces of the end panels and intermediate plates must be coated, including the sealing surface and cutout interiors.



1. Glovebox Exhaust Filter Fire Screen (Drawing [XXXXX Sheet Q-XXXX]) – The fire screen must not be coated.
2. Open Front Box Exhaust Filter Screen (Drawing [XXXXX Sheet Q-XXXX]) – The screen must not be coated.
3. Gloveports – The gloveports must be coated as shown below.



1. Shelf (Drawing [XXXXX Sheet Q-XXXX]) – The shelf and its corresponding rods must be coated except for the rod threads. The rod details are shown below.



1. Lattice Rods (Drawing [XXXXX Sheet Q-XXXX]) – The lattice rods must not be coated.
2. Cup Sink (Drawing [XXXXX Sheet Q-XXXX]) – The internal surfaces of sinks and bottom surface of the drainpipes must be coated.
3. Transfer Door – The required coated surfaces for each transfer door component is dictated below.
	* + - 1. Sealing Plate (Drawing [XXXXX Sheet Q-XXXX Part Number –XX]) – The sealing plate must be coated except for holes and the surfaces shown below. The wedge mount locations must have a 1/16” oversized clearance all around the mounting areas.



* + - * 1. Carrier Plate (Drawing [XXXXX Sheet Q-XXXX Part Number –X]) – The carrier plate must be coated except for holes and the surfaces shown below. The cylinder rod bracket mount location and wedge mount locations must have a 1/16” oversized clearance all around the mounting areas.



* + - * 1. Guide Rails (Drawing [XXXXX Sheet Q-XXXX Part Number –XX]) – The guide rails must be coated except for holes, the bottom end of the rail, and the surfaces shown below.



* + - * 1. Door Bottom Plate (Drawing [XXXXX Sheet Q-XXXX Part Number –XX]) – The entire door bottom plate must be coated except for the surfaces shown below.



* + - * 1. Pin Brackets (Drawing [XXXXX Sheet Q-XXXX Part Numbers -XX and –XX]) – The pin brackets must be coated entirely except for the holes and slots.
				2. Gasket Retainer (Drawing [XXXXX Sheet Q-XXXX Part Number –XX]) – The gasket retainer must be coated as shown below except for the holes.



* + - * 1. Carrier Plate Stop Blocks (Drawing [XXXXX Sheet Q-XXXX Part Number –XX]) – The carrier plate stop blocks must be coated entirely except for the holes.
				2. Cylinder Rod Bracket (Drawing [XXXXX Sheet Q-XXXX Part Number –XX]) – The cylinder rod bracket must be coated entirely except for the holes and the surfaces shown below.



* + - * 1. Mounting Plate (Drawing [XXXXX Sheet Q-XXXX Part Number –XX]) – The mounting plate must be coated entirely except for the holes and the surfaces shown below.



* + - * 1. Wedges (Drawing [XXXXX Sheet Q-XXXX Part Numbers -X and –X]) – The wedges must not be coated.

ATTACHMENT D

EXAMPLES OF THREE-WAY LOCK CORNERS

