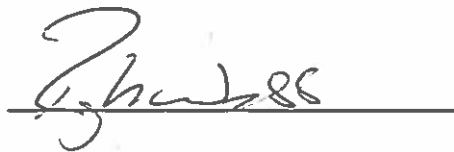


NAVAL SEA SYSTEMS COMMMAND
PROCESS INSTRUCTION 001
NAVSEA-00C3-PI-001
REVISION A

APPLICATION PROCEDURE OF FORMULA 150 PRIMER & 152 TOPCOAT
WHITE COATINGS ON PORTABLE OR AFLOAT RECOMPRESSION
CHAMBER SYSTEMS

APPROVED:

A handwritten signature in black ink, appearing to read "R. Webb", is written over a solid horizontal line.

Ryan Webb, NAVSEA 00C3

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Michael Frey, NAVSEA 00C

SCOPE

Chambers shall be painted utilizing original paint specifications and in accordance with approved NAVSEA or NAVFAC procedures. The following NAVSEA approved procedure provides the minimum requirements for paint removal, surface preparation, repainting and air sampling of the interior of Navy Steel & Stainless Steel Portable or Afloat Recompression Chamber Systems using Formula 150 Primer and 152 Topcoat White in accordance with MIL-DTL-24441D.

In the event of a conflict between any portion of this procedure and the referenced specifications, data sheets, or drawings, such conflicts shall immediately be brought to NAVSEA 00C3 attention. Locally prescribed procedures may be used if they exceed the requirements of this procedure and are approved by NAVSEA 00C.

The use of chipping hammers, needle guns and other mechanical paint removing power tools of this type are not authorized for use on recompression chambers. Chemical paint stripper/removers are also not authorized.

For ease of use, this procedure is written in **THREE** sections:

- **SECTION ONE** - Procedure for conducting spot repairs and touch-up painting.
- **SECTION TWO** - Procedure for removal of all paint and completely repainting the interior surface of recompression chambers.
- **SECTION THREE** - Procedure for conducting atmospheric sampling after completing SECTION ONE or SECTION TWO of this procedure.

STANDARDS AND CODES

Applicable sections of the following documents form part of this procedure; latest editions and revisions apply.

NAVSEA TS500-AU-SPN-010	U.S. Navy General Specification for the Design, Construction, and Repair of Diving and Hyperbaric Equipment
SS521-AA-MAN-010	U.S. Navy Diving and Manned Hyperbaric Systems Safety Certification Manual
SS521-AG-PRO-010	U.S. Navy Dive Manual
MIL-DTL-2441D	Detail Specification, Paint, Epoxy-Polyamide, General Specification
OSHA-2206	Occupational Safety & Health Act (29 CFR 1910)
SSPC	Steel Structures Painting Council - Painting and Surface Preparation Standards
	<ul style="list-style-type: none"> • SSPC-SP1 - Solvent Cleaning • SSPC-SP2 - Hand Tool Cleaning • SSPC-SP5 - White Metal Blast Cleaning • SSPC-PA2 - "Measurement of Dry Paint Thickness with Non-Destructive Magnetic Gauges"

PAINT APPLICATION CONDITIONS:

To prevent moisture condensation on the chamber surface and subsequent failure of the paint application, the coating system shall be applied when the air and surface temperature of the chamber are above 41°F with the optimum surface temperature being between 70°-80°F but not exceeding 100°F. Ensure that the maximum/minimum

temperatures for the Formula 150/152 coating system are not exceeded. Temperature must be maintained during curing. The Dew Point is the temperature at which moisture will condense on the surface. Formula 150/152 shall not be applied unless the ambient temperature is at least 5°F above the dew point and not falling. Document the application conditions for each coat per the procedure.

A dew point chart has been provided below for reference:

Dew Point Chart

		AMBIENT AIR TEMPERATURE °F										
		20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
HUMIDITY %	90	18	28	37	47	57	67	77	87	97	107	117
	85	17	26	36	45	55	65	75	84	95	104	113
	80	16	25	34	44	54	63	73	82	93	102	110
	75	15	23	33	42	52	62	71	80	91	100	108
	70	13	22	31	40	50	60	68	78	88	96	105
	65	12	20	29	38	47	57	66	76	85	93	103
	60	11	19	27	36	45	55	64	73	83	92	101
	55	9	17	25	34	43	53	61	70	80	89	98
	50	6	15	23	31	40	50	59	67	77	86	94
	45	4	13	21	29	37	47	56	64	73	82	91
	40	1	11	18	26	35	43	52	61	69	78	87
	35	-2	8	16	23	31	40	48	57	65	74	83
	30	-6	4	13	20	28	36	44	52	61	69	77

Example: If air temperature is 70°F and relative humidity is 65%, the dew point is 57°F. Therefore, no coating should be applied unless surface temperature is above 62°F (57°+5°F).

SECTION 1: PROCEDURE FOR SPOT REPAIRS/TOUCH-UP PAINTING

This section is to be used for spot repairs to the interior of recompression chambers. Spots that require repair include areas that are chipping/cracking, areas without paint as well as areas that exceed the 10 mil thickness parameter. Spot/Touch-up painting is considered to be any area or areas which make up 20% or less of the entire interior chamber surface area. If considering painting an area greater than 20%, contact NAVSEA 00C3 and NAVSEA 00C4 to discuss requirements and procedures. Spot repairs that encompass less than 10% of the chamber interior surface area is considered minor and will not require a gas sample per Section Three of this process instruction.

It is best practice to perform spot repairs and touch-up painting utilizing the paint specification used during the last complete interior repaint of the chamber. If the paint specification is unavailable, discontinued or no longer approved for use, alternative approved paints and their associated Process Instructions may be used. If further guidance is required, contact NAVSEA 00C3 and NAVSEA 00C4. For application of Carboguard 890H paint, refer to Process Instruction 008 (PI-008).

EQUIPMENT/MATERIALS:

The following is a list of equipment that is recommended, but not limited too, for paint removal and spot painting of a recompression chamber.

- Formula 150 Primer, NSN 8010-01-302-3608 (10 Gal Kit) or NSN 8010-01-350-4742 (2 Gal Kit)
- Formula 152 Top coat white, NSN 8010-01-302-3606 (10 Gal Kit) or NSN 8010-01-350-4743 (2 Gal Kit)
- Paint Solvent
- Emery/Sand Paper, 60/80 grit
- Emery/Sand Paper, 200 grit
- Paint Brush
- Wire Brush
- Lint Free Rags
- Tank-type Vacuum Cleaner
- Ventilation Blower (Red Devil or equivalent)
- Water
- Non-ionic Detergent (NID)
- Dry Film Thickness Gauge (Elcometer, Mikrotest II or III, or equivalent)
- Respirator/organic vapor filter

PROCEDURE:

Initial or check the steps of below procedure as they are accomplished. Provide the information requested where blanks are provided. Initialing or checking a step means that responsible, technically qualified personnel have authorized, performed, accepted, and tested the work accomplished. Evaluating the condition of the coating system (paint) of a chamber prior to the start of work is critical for determining the extent of painting required.

If a vendor is selected to paint the chamber, then that vendor shall provide all necessary documentation to indicate that the steps of procedure have been followed and that technically qualified personnel have performed the work. The vendor shall protect all gasket surfaces, flange faces, valve stems, name plates, pressure gauges, instrument cases, gauge glasses, electrical fixtures, and all previously installed and coated equipment.

This form provides the minimum documentation requirements to support REC. Retain a copy of this completed procedure in the REC.

1. _____ Inspect the entire interior/exterior painted surface of the chamber. Inspect the coating system for blistering, chipped, cracked, peeling, flaking, rust and corrosion.
2. _____ For interior finishes, determine the total square feet that must be repaired _____ ft² then determine the percent of total surface area to be repaired _____. If spot repairs make up 20% or less of the entire interior chamber surface area, move to Step 3. If spot repairs make up more than 20% of the entire interior chamber surface area, contact the NAVSEA 00C3 and NAVSEA 00C4 for further guidance.
3. _____ Open a REC in accordance with local instruction. REC #_____.
4. _____ Red tag chamber primary and secondary supply valves.
5. _____ Rig blower to provide chamber ventilation. The blower's outside ducting should reach to the far end of the inner lock.
6. _____ Clean/wire brush bare surfaces to remove loose scale, rust and dirt.
7. _____ Sand the damaged area to a feather edge using 60/80 grit emery/sand-paper. Ensure that the bare metal has a bright surface appearance.
8. _____ Continue to feather edges using the 200 grit sandpaper. Continue steps 5 and 6 until the transition from the bare metal to painted surface is smooth.
9. _____ Repeat steps 4 through 6 on all areas that need to be refinished.
10. _____ Clean/Vacuum areas that were sanded until all paint chips and visible dust are removed from the chamber.
11. _____ Wipe areas that were sanded with a clean lint free rag moistened with the same solvent as is used to clean the paint brushes.
12. _____ Allow the surfaces 2 hours to dry completely and then paint prepared spots as soon as possible.

NOTE

AFTER CLEANING AND PREPPING AREAS, BE CAREFUL NOT TO TOUCH BARE METAL AREAS WITH FINGERS. OIL, SALTS AND OTHER PARICULATES FROM THE SKIN WILL CAUSE POOR ADHESION AND COULD CAUSE THE METAL TO CORRODE. APPLY PRIMER TO REPAIED AREAS AS SOON AS POSSIBLE, NEVER ALLOWING MORE THAN 6 HOURS TO PASS WITHOUT PRIMING. IF THE PREPPED AREA DOES NOT GET AT LEAST ONE COAT OF PAINT WITHING 6 HOURS THEN THE ENTIRE AREA SHOULD BE RE-SANDED.

13. _____ Apply one thin coat of Formula 150 Primer. Primer must cover all bare surfaces. Primer shall not exceed 4 mils thickness.
14. _____ The primer must dry for a minimum of 24 hours. Ventilate the chamber; air and surface temperature shall be maintained at the optimum temperature of 70°-80°F but not exceeding 100°F. Contact NAVSEA 00C3 if conditions dictate application at lower than optimum temperatures.
15. _____ After primer has completely dried, wipe repaired areas with a clean lint free rag.

16. _____ Apply one thin coat of Formula 152 Top Coat White Paint.
17. _____ The paint must dry for a minimum of 24 hours. Ventilate the chamber; air and surface temperature shall be maintained at the optimum temperature of 70°-80°F but not exceeding 100°F. Contact NAVSEA 00C3 if conditions dictate application at lower than optimum temperatures.
18. _____ When paint is completely dry, wipe down entire interior surface of the chamber with a clean lint free rag moistened with non-ionic detergent (NID) and water.
19. _____ Use a calibrated dry film thickness gauge to ensure proper application thickness. Verify that the repaired area(s) paint thickness does not exceed the thickness of the original paint.
20. _____ If the repaired area(s) exceeded 10% of the chamber interior surface, skip to Section Three of this process instruction to sample the chamber atmosphere for contaminants and close out the REC. If the air sample was not required, skip to Step 21 of this procedure.
21. _____ Remove the Red tags
22. _____ Close the REC and put the chamber back into service.

SECTION 2: PROCEDURE FOR COMPLETE REPAINT OF INTERIOR SURFACE

This section is to be used for removing all paint from the interior of the chamber by grit blasting and completely refinishing the interior of recompression chambers.

EQUIPMENT/MATERIALS:

If a vendor is selected to paint the chamber, then that vendor should provide all necessary tools, equipment and personnel. The following is a list of equipment that is recommended, but not limited too, for paint removal and painting of a recompression chamber.

- Formula 150 Primer, NSN 8010-01-302-3608 (10 Gal Kit) or NSN 8010-01-350-4742 (2 Gal Kit)
- Formula 152 Top coat white, NSN 8010-01-302-3606 (10 Gal Kit) or NSN 8010-01-350-4743 (2 Gal Kit)
- Paint Solvent
- Emery/Sand Paper, 60/80 grit
- Emery/Sand Paper, 200 grit
- Paint Brush
- Wire Brush
- Spray Paint Equipment
- Lint Free Rags
- Tank-type Vacuum Cleaner
- Ventilation Blower (Red Devil or equivalent)
- Water
- Non-ionic Detergent (NID)
- Dry Film Thickness Gauge (Elcometer, Mikrotest II or III, or equivalent)
- Surface Profile Gauge & Replica Tape
- Respirator/organic vapor filter
- Wrenches
- Tape, Antiseizing, MIL-T-27730
- Polyurethane Bags
- Plugs and Caps
- Plywood
- Rubber Gaskets
- Masking Tape
- Full Face Shield, Air Supplied Breathing Mask
- Sand Blaster & Blasting Abrasive (to achieve 1.0-1.5 mil anchor profile)

PROCEDURE:

Initial or check the steps of below procedure as they are accomplished. Provide the information requested where blanks are provided. Initialing or checking a step means that responsible, technically qualified personnel have authorized, performed, accepted, and tested the work accomplished. Evaluating the condition of the coating system (paint) of a chamber prior to the start of work is critical for determining the extent of painting required.

If a vendor is selected to paint the chamber, then that vendor shall provide all necessary documentation to indicate that the steps of procedure have been followed and that technically qualified personnel have performed the work. The vendor shall protect all gasket surfaces, flange faces, valve stems, name plates, pressure gauges, instrument cases, gauge glasses, electrical fixtures, and all previously installed and coated equipment.

This form provides the minimum documentation requirements to support REC. Retain a copy of this completed procedure in the REC.

1. _____ Open a Re-entry Control procedure in accordance with local instruction REC #_____.
2. _____ Red tag chamber primary and secondary supply valves.
3. _____ Remove interior air, oxygen, TX Gas and ECS piping and fittings at break down joints.
4. _____ Plug or cap all openings and penetrators using clean non-plastic plugs and caps. Use Antiseizing Tape, MIL-T-27730 on pipe threads.
5. _____ Tape and double bag all removed parts. Store in a clean secure place until ready for reassembly.
6. _____ Remove deck plates and all other removable parts from the chamber.
7. _____ Remove view ports using the appropriate MIP for the chamber system. Verify view port manufacturing dates.
8. _____ Manufacture rubber gaskets for use in viewport flange. Manufacture one-half inch plywood protective covers or similar templates for use as viewport replacements during painting operations. The retaining rings should be used as templates.
9. _____ Place the rubber gaskets with the plywood templates as a backing against the viewport sealing area. Secure gaskets and template backing in place with the view port retaining rings or use a t-bolt inserted through hole drilled in the center of the template and secured in place with the strong-back of the chamber.
10. _____ Carefully place a minimum of 3 layers of masking tape over door gaskets, gasket sealing surface and any exposed or non-painted sealing surface.

NOTE

ABRASIVES FROM BLASTING CAN MIGRATE INTO THE BEARING GREASE/SURFACE OF THE DOOR HINGE BEARINGS. REMOVAL AND CLEANING OR REPLACEMENT OF THE DOOR HINGE BEARINGS MAY BE EVALUATED AND CONSIDERED.

11. _____ Protect all remaining components not removed from interior of chamber from sand blasting effort. Reinstall bolts or sacrificial bolts into exposed female threads to protect threads from degradation and accumulation of sand shot.
12. _____ Set up ventilation blower to evacuate dust from the interior of the chamber during grit blasting operations.
13. _____ As required, construct protective covers/enclosures at the chamber entrance as required to protect adjacent machinery, piping, and/or other equipment from contamination.
14. _____ Rig up the full face shield air supplied breathing mask. The person operating the blaster shall wear a full set of protective clothing with openings taped to protect bare skin. A Tender shall be stationed immediately outside the door during the blasting operations

15. _____ Utilizing the sand blaster and appropriate blasting abrasive, blast the paint off the interior of the chamber to white metal in accordance with SSPC-SP5.

CAUTION

NEVER ALLOW NOZZLE OF THE BLASTER TO STAY IN ONE PLACE OR DAMAGE TO CHAMBER SHELL CAN OCCUR. ALWAYS KEEP THE NOZZLE MOVING IN A SLOW PATTERN WORKING IN SECTIONS.

16. _____ Using a calibrated surface profile gauge and replica tape, spot check the interior surface at ten (10) locations to verify that the surface profile at all locations is between 1.0 to 1.5 mils. Be sure to wipe areas to be measured clean with a lint free rag moistened with solvent.
17. _____ Clean/Vacuum areas that were sanded until all paint chips and visible dust are removed from the chamber.
18. _____ Wipe down entire surface with clean, lint free rags moistened with the same solvent as is used to clean the spray equipment.
19. _____ Allow the surfaces 2 hours to dry completely and then paint as soon as possible.

NOTE

AFTER CLEANING AND PREPPING AREAS, BE CAREFUL NOT TO TOUCH BARE METAL AREAS WITH FINGERS. OIL, SALTS AND OTHER PARTICULATES FROM THE SKIN WILL CAUSE POOR ADHESION AND COULD CAUSE THE METAL TO CORRODE. APPLY PRIMER TO PREPPED AREAS AS SOON AS POSSIBLE, NEVER ALLOWING MORE THAN 6 HOURS TO PASS WITHOUT PRIMING. IF THE PREPPED AREA DOES NOT GET AT LEAST ONE COAT OF PRIMER WITHIN 6 HOURS THEN THE ENTIRE AREA SHOULD BE RE-BLASTED.

20. _____ Set up spray painting equipment. Spray gun should be cleaned with solvent.

NOTE

IT IS RECOMMENDED TO PAINT A SCRAP PIECE OF METAL PRIOR TO THE START OF WORK TO ENSURE THE CORRECT FILM THICKNESS WILL BE OBTAINED DURING ACTUAL APPLICATION.

FOR ANY SPILLAGES, ONLY USE THE PAINT SOLVENT TO CLEAN. ABSORB AND DISPOSE OF IN ACCORDANCE WITH LOCAL REGULATIONS.

21. _____ Apply one thin coat of Formula 150 Primer. Primer shall not exceed 4 mils thickness.

22. _____ The primer must dry for a minimum of 24 hours. Ventilate the chamber; air and surface temperature shall be maintained at the optimum temperature of 70°-80°F but not exceeding 100°F. Contact NAVSEA 00C3 if conditions dictate application at lower than optimum temperatures.
23. _____ After primer has completely dried, wipe down entire surface with a clean lint free rag.
24. _____ Apply one thin even coat of Formula 152 Top Coat White Paint.
25. _____ The paint must dry for a minimum of 72 hours. Ventilate the chamber; air and surface temperature shall be maintained at the optimum temperature of 70°-80°F but not exceeding 100°F. Contact NAVSEA 00C3 if conditions dictate application at lower than optimum temperatures.
26. _____ When paint is completely dry, measure the thickness of the paint using a calibrated dry film thickness gauge. Start at the front of the outer lock and measure points two feet apart around the circumference of the chamber. Mark any spots that exceed 10 mils thick. Move toward inner lock two feet and repeat the process. Repeat the above process until the full length of the chamber has been checked. Refinish areas thicker than 10 mils in accordance with Section One of this procedure.
27. _____ Reassemble Air, O2, TX Gas and ECS fittings and conduct Joint Tightness Testing to system maximum operating pressure (s).
28. _____ Reinstall viewports using the appropriate MIP for the chamber system.
29. _____ Wipe down the entire interior surface of the chamber using a lint free rag moistened with non-ionic detergent (NID) and water.
30. _____ Conduct Recompression Chamber leak test IAW, U.S. Navy Diving Manual, Chapter 21, Figure 21-15.
31. _____ Conduct interior atmosphere sampling in accordance with Section Three of this procedure. The REC can be closed and the chamber can be put back into service following successful air sampling per Section Three.

SECTION 3: ATMOSPHERIC SAMPLING

This section is to be used for conducting atmosphere sampling after completing either partial or full painting of the interior of a recompression chamber.

EQUIPMENT/MATERIALS:

- Gas sample cylinder kit from an approved laboratory.
- Wrenches

PROCEDURE:

Initial each step as completed.

1. _____ Prior to taking the gas sample, pressurize the chamber to a depth of 165 FSW and return to the surface twice.

NOTE

IF A STRONG PAINT ODOR IS NOTED AFTER THE CHAMBER DOORS HAVE BEEN SECURED FOR A PERIOD OF TIME, THE CHAMBER MAY REQUIRE MORE PRESSURE CYCLES.

IF TWO INDIVIDUALS WITH REASONABLE SMELLING SENSES FIND THE ODOR TO BE OBJECTIONABLE, CONTACT NAVSEA 00C3 AND NAVSEA 00C4 SHALL BE CONTACTED PRIOR TO GAS SAMPLING FOR FURTHER GUIDANCE.

2. _____ Pressurize entire chamber to 60 FSW. Once depth has been reached, do not add air to maintain depth.
3. _____ Let chamber stand at depth for a minimum of 24 hours.
4. _____ Ensure gas sample cylinder (e.g. bomb) sample inlet and exhaust are closed.
5. _____ Connect gas sample cylinder using an easily accessed connection (e.g. gauge port).
6. _____ Open the valve where the connection was made to the chamber (e.g. gauge port valve).
7. _____ Slowly open the gas sample cylinder inlet. Slowly open the gas sample cylinder exhaust. Vent the gas sample cylinder for a minimum of 15 seconds, but not to exceed 30 seconds.
8. _____ Close gas sample cylinder exhaust, allow pressure to equalize.
9. _____ Close gas sample cylinder inlet.
10. _____ Close valve where the connection was made to the chamber (e.g. gauge port valve).
11. _____ Remove gas sample cylinder from the chamber port.
12. _____ Bring chamber to the surface.
13. _____ Return the gas sample to the laboratory and have it analyzed for the following contaminants:

CONTAMINANT	MAX LIMIT (PPM)
Butyl Alcohol	100
Isopropanol	50
Toluene	50
Methyl Isobutyl Ketone	100
Vinyl Chloride	2
Benzene	1
Carbon Dioxide	1000
Carbon Monoxide	20
Methane	1000
Total Hydrocarbons less Methane	25
Halogenated Hydrocarbons	5

NOTE

IF THE ANALYSIS REPORT IS UNSATISFACTORY, PLACE HEAT LAMPS INSIDE THE CHAMBER INNER AND OUTER LOCKS. MAINTAIN A CHAMBER TEMPERATURE AT 85 DEGREES FAHRENHEIT FOR A MINIMUM OF 72 HOURS. TAKE ANOTHER GAS SAMPLE AS ABOVE. IF THE SECOND SAMPLE IS STILL UNSATISFACTORY CONTACT NAVSEA 00C3 AND NAVSEA 00C4 FOR FURTHER GUIDANCE.

14. _____ Place a copy of the satisfactory air sample results in the REC.
15. _____ Remove the Red tags.
16. _____ Close the REC and put the chamber back into service.