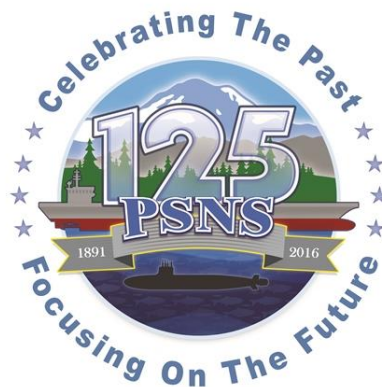


UIPI 6320-901

By Tom Stamey

C/260M

Puget Sound Naval Shipyard



Overview

- What is a UIPI?
- What is UIPI 6320-901?
- An example repair using UIPI 6320-901
- How close is this thing to approval?

What is a UIPI?

- Uniform Industrial Process Instruction
- NAVSEA approved document that governs work performed at the four public shipyards.
- Includes things like:
 - Electroplating repairs
 - Epoxy repairs
 - Component testing requirements
 - Standardized quality assurance forms
- UIPIs do three main things:
 - Align the work all four shipyards do
 - Provide technical limits on repairs
 - Authorize repairs within those limits without additional NAVSEA approval



What is UIPI 6320-901?

- Provides a method for developing and approving cold spray procedures for NAVSEA applications.
- Provides requirements for use of those procedures.

UNIFORM INDUSTRIAL PROCESS INSTRUCTION

Ref: PSNS&IMFINST 5240.1

TITLE: COLD SPRAY, PROCESSES AND QUALITY CONTROL OF

SECTIONS

- I EQUIPMENT
- II MATERIAL
- III OSH/ENVR
- IV QA
- V TRAINING/SKILL
- VI METHOD
- VII FEEDBACK

DISTRIBUTION

- SEA 04XB
- SEA 04X3
- SEA 042
- SEA 04RP
- SEA 04X6
- SEA 04X1
- SEA 05CT
- SEA 04X1

NAVSEA
NAVAL SEA SYSTEMS COMMAND
Puget Sound Naval Shipyard & Intermediate Maintenance Facility

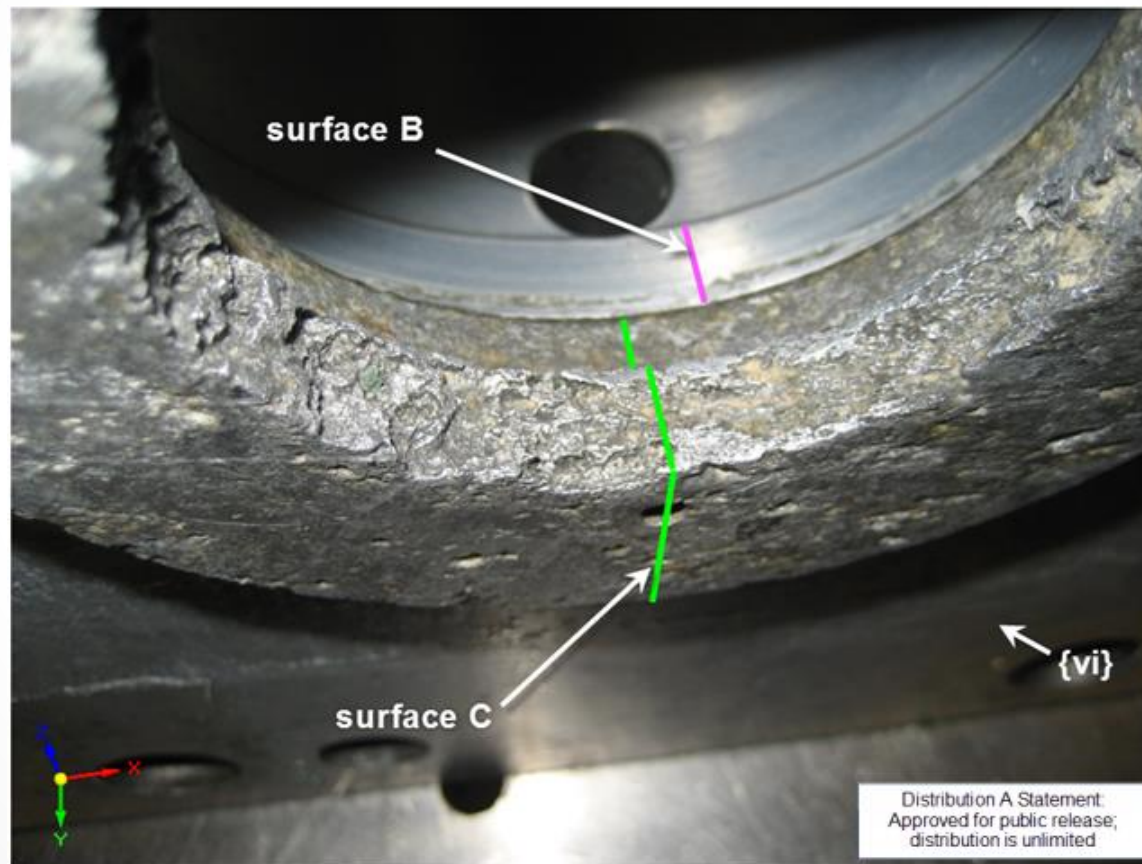
NO. CANCELS _____
ISSUE DATE _____

TYPE _____
SHIP CLASS CODE _____
SHIP SYSTEM _____
TSD _____
KEY SHOP _____
ASSIST SHOPS _____
LEAD CODE _____

6320-901
None

A
ALL SHIPS
ALL
Various

UIPI 6320-901: An example



UIPI 6320-901: An example

UNIFORM INDUSTRIAL PROCESS INSTRUCTION 6320-901

Appendix (A): Qualified Cold Spray Procedures

1. Introduction

- 1.1. This appendix collects all the QSPs qualified as of the issue of this document.
- 1.2. Table (A).1 lists the QSPs for easy reference.
- 1.3. QSPs from other responsible shipyards may be used prior to incorporation into this UIPI.

QSP #	Repair category	Substrate material/grade	Powder material	Powder manufacturer	Cold spray system	Page number

Table (A).1: List of qualified spray procedures

Note: At this time, there are no existing QSPs.

UIPI 6320-901: An example

XXXXXXXX.XX.XX.X

RESPONSIBLE SHIPYARD DESIGNATOR
SPRAY SERIAL NUMBER
PIECE, PART, OR FIND NUMBER
DRAWING NUMBER



QSP 123456.1.01.S

QSP number

XXX.

SUB-CATEGORY: S (STATIC) / D (DYNAMIC)
SUB-CATEGORY: N (NON-CORROSIVE ENVIRONMENT) / C (CORROSIVE ENVIRONMENT)
REPAIR CATEGORY: 1 / 2 / 3 / 4



2.C.S

repair class

UIPI 6320-901: An example

UNIFORM INDUSTRIAL PROCESS INSTRUCTION 6320-901

Category 1 repair	<p>Repair to a component that is not in a sealing or bearing area.</p> <p>Repair may be in a pressure boundary area provided repair does not violate the applicable repair standard (e.g. SMS or technical manual) for wall thickness.</p>
Category 2 repair	<p>Repair to a component that is in a sealing or bearing area.</p> <p>Repair may be in a pressure boundary area provided repair does not violate the applicable repair standard (e.g. SMS or technical manual) for wall thickness.</p>
Category 3 repair	<p>Repair to a component that violates applicable repair standard (e.g. SMS or technical manual) for wall thickness, but is in an area loaded in shear or compression and does not form the primary pressure boundary or load bearing part of the component.</p> <p>Examples are the bottom of a packing gland, the non-sealing side of an o-ring groove (the side wetted by system fluid), and dowel pin holes.</p>
Category 4 repair	<p>Repair to a component that violates applicable repair standard (e.g. SMS or technical manual) for wall thickness and is used to restore the strength of the component.</p> <p>Specifically excluded are category 3 repairs.</p> <p>Note: Category 4 repairs are not authorized by this UIPI at this time. It is anticipated that continued advancements in technology will allow use of category 4 repairs in the future.</p>
Subcategory n repair	<p>Repair to a component that is not in a corrosive environment (e.g. seawater or brine).</p>

●

●

UIPI 6320-901: An example

UNIFORM INDUSTRIAL PROCESS INSTRUCTION 6320-901

Appendix (E): QSP Form and Procedures

Qualified Spray Procedure (QSP) (EPD fill in blocks identified by ♦ prior to issue)
(Blocks marked » are critical parameters)

Sheet ___ of ___

1. SHIP/HULL NO. ♦ USS SHIP (ISSN-001)	2. JCN/CONTRACT NO. ♦ 38123-456789-H01	3. NEW QSP NUMBER ♦ 1234561.01.S
4. SYSTEM/COMPONENT ♦ Actuator-I	5. DWG. ♦ » 123456 rev 0	6. PART NUMBER ♦ » pc-1
7. DESCRIPTION ♦ actuator body	8. REPAIR CATEGORY ♦ 2.C.S	9. REPAIR LOCATION ♦ lower pinion bearing bore
10. MATERIAL AND GRADE ♦ Aluminum 6061 T651		

11. PART PREPARATION

SURFACE FINISH »	SURFACE PREP METHOD »	CLEANING METHOD
GRIT TYPE/SIZE	GRIT BLAST PRESSURE	PREP DIMENSION

SIGNATURE/BADGE/DATE:

12. POWDER

POWDER MATERIAL ♦ » 6061 aluminum	POWDER SIZE »	POWDER LOT
POWDER MANUFACTURE »	POWDER SPECIFICATION »	POWDER BAKE TEMP/TIME »
PEENING MEDIA »	PEENING MEDIA SIZE »	PEENING MEDIA LOT
BOND LAYER %PEENING MEDIA »	SUBSEQUENT BOND LAYER(S) %PEENING MEDIA »	BULK BUILD %PEENING MEDIA »

13. GAS DATA

CARRIER GAS »	CARRIER GAS TEMP AND MEASUREMENT LOCATION »	
FEEDER GAS »	FEEDER GAS TEMP AND MEASUREMENT LOCATION »	
GAS MODE: <input type="checkbox"/> PRESSURE <input type="checkbox"/> QUANTITY	CARRIER GAS PRESSURE »	FEEDER GAS PRESSURE »
	CARRIER GAS FLOW »	FEEDER GAS FLOW »

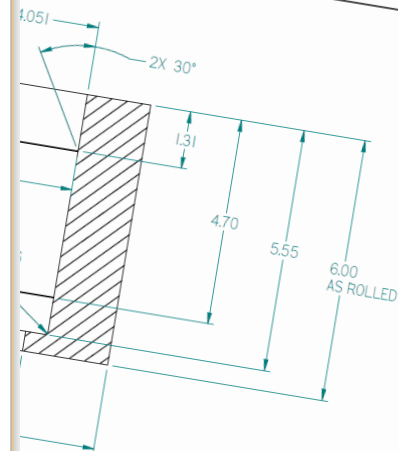
14. APPLICATION DATA

COLD SPRAY SYSTEM »	COMPONENT PREHEAT »	PREHEAT METHOD
ROBOT BRAND/MODEL	ROBOT PROGRAM FILE NAME	
NOZZLE COOLING METHOD »	POWDER FEED RATE »	
NOZZLE »	STANDOFF »	
TRAVERSE RATE 1 »	INCREMENT 1 »	DEPOSITION ANGLE 1 »
TRAVERSE RATE 2 »	INCREMENT 2 »	DEPOSITION ANGLE 2 »
TRAVERSE RATE 3 »	INCREMENT 3 »	DEPOSITION ANGLE 3 »
SIGNATURE/BADGE/DATE:		

INSTRUCTION 6320-901

in blocks identified by ♦ prior to issue)

Sheet ___ of ___



INSTRUCTION 6320-901
Sheet ___ of ___

GDE/DATE

UIPI

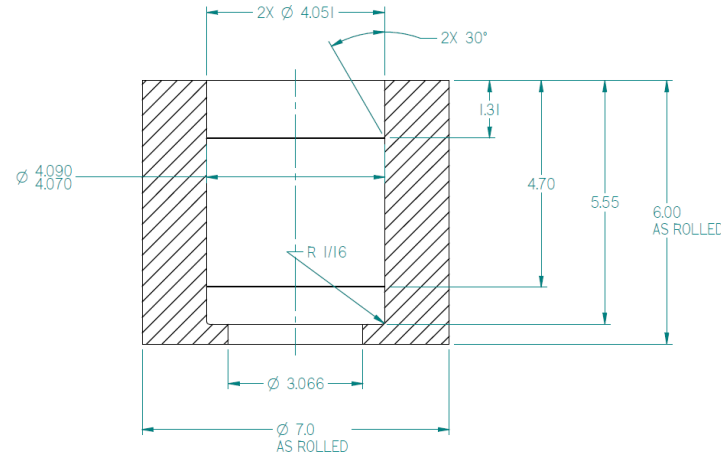
Sample

UNIFORM INDUSTRIAL PROCESS INSTRUCTION 6320-901

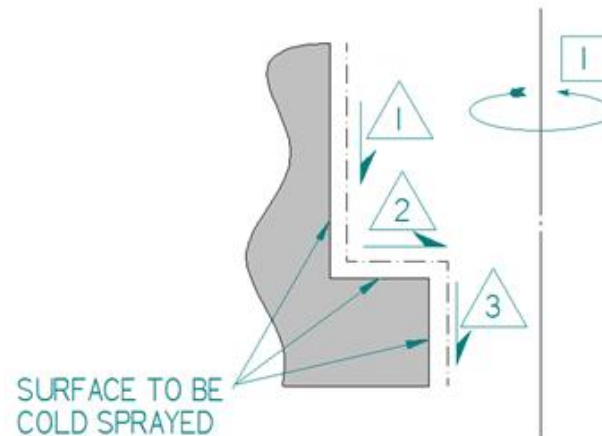
Qualified Spray Procedure (QSP) (EPD fill in blocks identified by ♦ prior to issue)
(Blocks marked ▶▶ are critical parameters)

Sheet ____ of ____

15. MOCK-UP SKETCH ▶▶



16. SPRAY PATH SKETCH ▶▶



UNIFORM INDUSTRIAL PROCESS INSTRUCTION 6320-901 Appendix (E)

Qualified Spray Procedure (QSP) (EPD fill in blocks identified by ♦ prior to issue)
(Blocks marked ▶▶ are critical parameters)

1. SHIP/HULL NO. ♦
USS SHIP (ISSN-0011) 2.

4. SYSTEM/COMPONENT ♦
Actuator-I 5.

7. DESCRIPTION ♦
actuator body 8.

10. MATERIAL AND GRADE ♦
Aluminum 9.

11. PART PREPARATION
SURFACE FINISH ▶▶

GRIT TYPE/SIZE

SIGNATURE/BADGE/DATE:

12. POWDER
POWDER MATERIAL ♦▶▶
6061 aluminum

POWDER MANUFACTURE ▶▶

PEENING MEDIA ▶▶

BOND LAYER
%PEENING MEDIA ▶▶

13. GAS DATA
CARRIER GAS ▶▶

FEEDER GAS ▶▶

GAS MODE:
□ PRESSURE
□ QUANTITY

14. APPLICATION DATA
COLD SPRAY SYSTEM

ROBOT BRAND/MODE

NOZZLE COOLING M

NOZZLE ▶▶

TRAVERSE RATE

TRAVERSE RATE

TRAVERSE RATE

UNIFORM INDUSTRIAL PROCESS INSTRUCTION 6320-901
Qualified by ♦ prior to issue
SIGNATURE/BADGE/DATE Sheet ____ of ____

INSPECTOR
SIGNATURE/BADGE/DATE

UIPI 6320-901: An example

UNIFORM INDUSTRIAL PROCESS INSTRUCTION

Appendix (E): QSP Form and Procedures

Qualified Spray Procedure (QSP) (EPD fill in blocks identified by ♦ prior to issue)

(Blocks marked ♦ are critical parameters)

1. SHIP/HULL NO. ♦ USS SHIP (ISSN-001) 2. JCN/CONTRACT NO. ♦ 38123-456789-H0

4. SYSTEM/COMPONENT ♦ Actuator-1 5. DWG ♦ 123456 rev 0 9. REPAIR CATEGORY ♦ 2.C.S. 9. REPAIR TYPE ♦ lower

7. DESCRIPTION ♦ actuator body 10. MATERIAL AND GRADE ♦ Aluminum 6061 T651

11. PART PREPARATION

SURFACE FINISH ♦ SURFACE PREP METHOD ♦ GRIT TYPE/SIZE GRIT BLAST PRESSURE

SIGNATURE/BADGE/DATE: POWDER SIZE ♦

12. POWDER

POWDER MATERIAL ♦ 6061 aluminum POWDER SPECIFICATION

POWDER MANUFACTURE ♦ PEENING MEDIA/SIZE

PEENING MEDIA ♦ SUBSEQUENT BOND %PEENING MEDIA

BOND LAYER %PEENING MEDIA

13. GAS DATA

CARRIER GAS ♦ CARRIER GAS

FEEDER GAS ♦ FEEDER GAS

GAS MODE: □ PRESSURE □ QUANTITY

14. APPLICATION DATA

COLD SPRAY SYSTEM ♦

ROBOT BRAND/MODEL

NOZZLE COOLING METHOD ♦

NOZZLE ♦

TRAVERSE RATE 1 ♦

TRAVERSE RATE 2 ♦

UNIFORM INDUSTRIAL PROCESS INSTRUCTION 6320-901

Qualified Spray Procedure (QSP) (EPD fill in blocks identified by ♦ prior to issue) Sheet ___ of ___

(Blocks marked ♦ are critical parameters)

15. MOCK-UP

16. SPRAY PATH SKETCH

17. FINAL DIMENSION

SIGNATURE/BADGE/DATE

18. TESTING

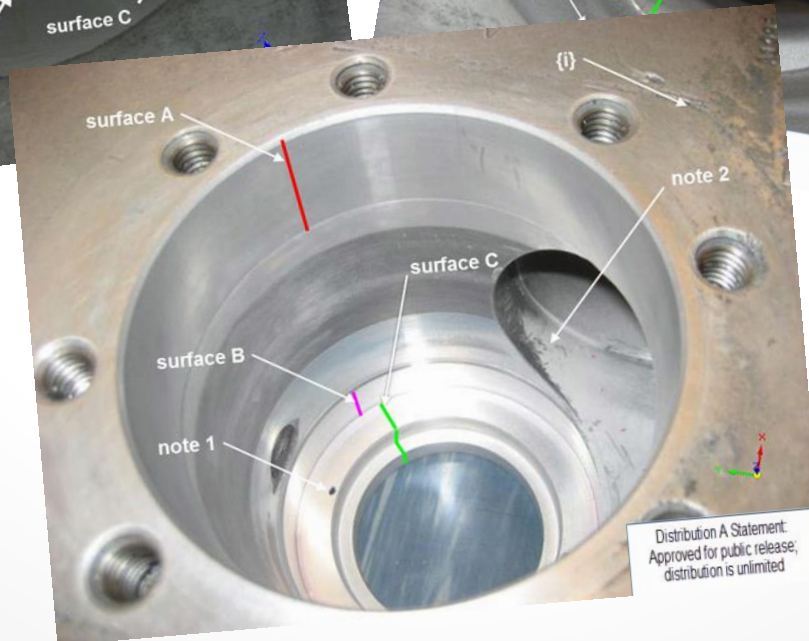
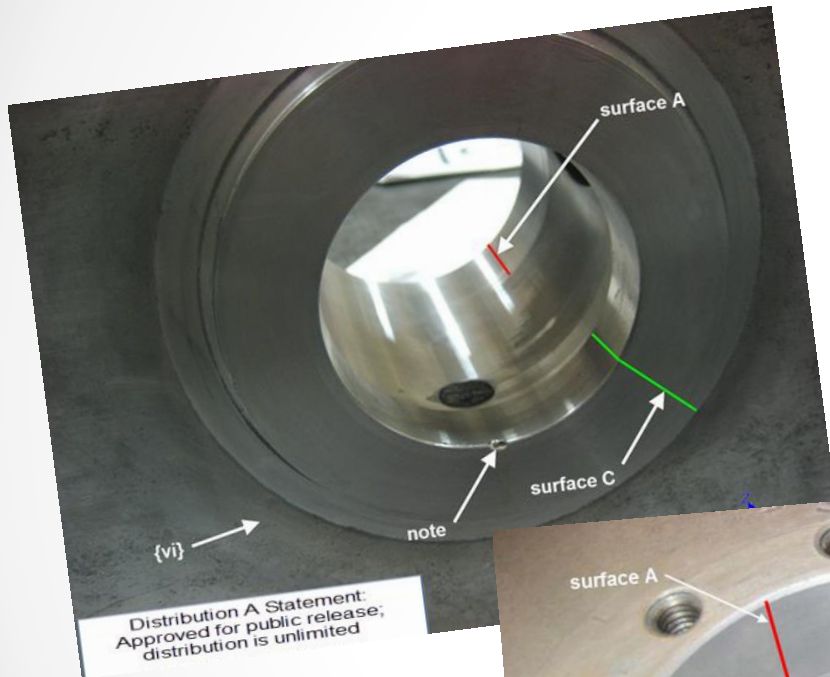
REQUIRED TEST ♦	RESULT	INSPECTOR SIGNATURE/BADGE/DATE
VT	□ SAT □ UNSAT	
□ MACHINE □ TAPE	□ SAT □ UNSAT	
RING	□ SAT □ UNSAT	
□ BOND BUTTON	AVERAGE:	
□ BOND DATA FROM QSP: _____	BUTTON 1:	
	BUTTON 2:	
	BUTTON 3:	
□ TENSILE	AVERAGE:	
□ TENSILE DATA FROM QSP: _____	COUPON 1:	
	COUPON 2:	
	COUPON 3:	
□ PT	□ SAT □ UNSAT	
□ NA	%POROSITY:	
□ MEM	%OXIDES:	
□ MEM DATA FROM QSP: _____		
□ WEAR	UNCOATED BLOCK SCAR WIDTH:	
□ WEAR DATA FROM QSP: _____	COLD SPRAY COATED BLOCK SCAR WIDTH:	
□ NA	ΔmV:	
□ Cg		
□ Cg DATA FROM QSP: _____		
□ NA		
□ Cc	NON-COATED MAX CREVICE DEPTH:	
□ Cc DATA FROM QSP: _____	COATED CREVICE MAX DEPTH:	
□ NA		
□ TRIPLE LUG SHEAR	AVERAGE:	
□ TRIPLE LUG SHEAR DATA FROM QSP: _____	LUG 1:	LUG 4:
□ NA	LUG 2:	LUG 5:
	LUG 3:	LUG 6:
		LUG 7:
		LUG 8:
		LUG 9:

19. REMARKS

UIPI 6320-901: An example

- Once all the testing is complete, the QSP becomes an authorized spray procedure that can be used by any of the shipyards.
- The procedure includes all the necessary information, from prep machining direction to spray path programming, to perform the required repair.

UIPI 6320-901: An example



UIPI 6320-901: An example

UNIFORM INDUSTRIAL PROCESS INSTRUCTION 6320-901

Appendix (D): CSAR Form and Procedures

Cold Spray Application Record (CSAR) (EPD fill in blocks identified by ♦ prior to issue) Sheet ___ of ___

(Blocks marked ♦ are critical parameters)

1. SHIP/HULL NO. ♦	2. JCN/CONTRACT NO. ♦	3. CWP/REC NO. ♦
4. SYSTEM/COMPONENT ♦	5. DWG ♦	6. PART NUMBER ♦
7. DESCRIPTION ♦	8. MATERIAL AND GRADE ♦	9. REPAIR LOCATION ♦
10. REPAIR CATEGORY ♦	11. QSP NUMBER ♦	
12. PART PREPARATION		CLEANING METHOD
SURFACE FINISH ♦		PREP DIMENSION
GRIT TYPE/SIZE		
SURFACE PREP METHOD ♦		
GRIT BLAST PRESSURE		
SIGNATURE/BADGE/DATE:		POWDER LOT
13. POWDER		POWDER BAKE TEMP/TIME ♦
POWDER MATERIAL ♦		PEENING MEDIA LOT
POWDER MANUFACTURE ♦		PEENING MEDIA SIZE ♦
PEENING MEDIA ♦		BULK BUILD %PEENING MEDIA ♦
BOND LAYER 1 %PEENING MEDIA ♦		SUBSEQUENT BOND LAYERS %PEENING MEDIA ♦
14. GAS DATA		
CARRIER GAS ♦		
FEEDER GAS ♦		
GAS MODE: <input type="checkbox"/> PRESSURE <input type="checkbox"/> QUANTITY		
CARRIER GAS TEMP AND MEASUREMENT LOCATION ♦		
FEEDER GAS TEMP AND MEASUREMENT LOCATION ♦		
CARRIER GAS PRESSURE ♦		
FEEDER GAS PRESSURE ♦		
CARRIER GAS FLOW ♦		
FEEDER GAS FLOW ♦		
15. APPLICATION DATA		
COLD SPRAY SYSTEM ♦		
COMPONENT PREHEAT ♦		
PREHEAT METHOD		
GUN MANIPULATION		
<input type="checkbox"/> ROBOT <input type="checkbox"/> HANDHELD		
ROBOT BRAND/MODEL		
ROBOT PROGRAM FILE NAME		
NOZZLE COOLING METHOD ♦		
POWDER FEED RATE ♦		
NOZZLE ♦		
STANDOFF ♦		
TRAVERSE RATE 1 ♦		
INCREMENT 1 ♦		
DEPOSITION ANGLE 1 ♦		
TRAVERSE RATE 2 ♦		
INCREMENT 2 ♦		
DEPOSITION ANGLE 2 ♦		
TRAVERSE RATE 3 ♦		
INCREMENT 3 ♦		
DEPOSITION ANGLE 3 ♦		
NATURE/BADGE/DATE:		
FINAL DIMENSION		

UNIFORM INDUSTRIAL PROCESS INSTRUCTION 6320-901

Cold Spray Application Record (CSAR) (EPD fill in blocks identified by ♦ prior to issue) Sheet ___ of ___

(Blocks marked ♦ are critical parameters)

16. ADDITIONAL SPRAY

GUN MANIPULATION

ROBOT BRAND/MODEL	<input type="checkbox"/> ROBOT <input type="checkbox"/> HANDHELD	ROBOT PROGRAM FILE NAME
NOZZLE COOLING METHOD ♦		POWDER FEED RATE ♦
NOZZLE ♦		STANDOFF ♦
TRAVERSE RATE 1 ♦		
TRAVERSE RATE 2 ♦	INCREMENT 1 ♦	DEPOSITION ANGLE 1 ♦
TRAVERSE RATE 3 ♦	INCREMENT 2 ♦	DEPOSITION ANGLE 2 ♦
NATURE/BADGE/DATE:	INCREMENT 3 ♦	DEPOSITION ANGLE 3 ♦
FINAL DIMENSION		

17. STING

RED TEST ♦	RESULT	SIGNATURE/BADGE/DATE
NE <input type="checkbox"/> TAPE	<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT	INSPECTOR SIGNATURE/BADGE/DATE
	<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT	
	<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT	
	<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT	
	<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT	

Is this approved?

- All shipyards have reviewed and commented on the UIPI.
- The comments are being incorporated.
- NAVSEA is aware of the UIPI and will review it when its provided.

Questions?

