

Standardization and Digitization of Visual Inspection for Shipbuilding

NSRP Surface Preparation and Coatings (SPC) Project



Past NSRP SPC Projects

An initial project successfully modified COTS (Commercial Off-The-Shelf) technology to output QA data in accordance with requirements of NAVSEA Standard Item 009-32.

NSRP SPC Projects completed

- **Phase I:** Electronically populated the NSI 009-32 appendices
- **Phase II:** Customized app functionality, OOS flagging, storage recall and communication between government and contractor
- **Phase III:** Implementing paperless paint

Past NSRP SPC Projects

Once the system was developed, the project team worked with Regional Maintenance Center QA representatives to identify a path forward to integrate the paperless capability into the Navy Maintenance process.

Features which take advantage of the paperless technology in the QA process include:

- Electronic event notification
- Auto-flag out of spec conditions
- Automate Non-Conformance reporting and resolution
- Quality control reports for contractor process improvement
- Deck plate sign offs
- Audit tracking for reports after sign off

Benefits of Paperless QA System

PROCESS IMPROVEMENT

COST REDUCTION

Increase transparency of inspection to the welding process

Minimize or eliminate delays associated with adjudication of out-of-spec items

Improve efficiency of inspection efforts

Reduce inspection cost

Transmit inspection data efficiently to decision-makers

Expedite decision making, reducing analysis cost and associated downtime

Archive inspection data for future use

Eliminate costs incurred to re-create history for assessments

Leverage inspection data to its fullest extent

More accessible information could be used for more efficient planning, facilitating process improvement, troubleshooting, etc.

Current NSRP SPC Project:

Standardization and Digitalization for Visual Inspection for Shipbuilding

Visual Inspection Technology

- Offline capable easy-to-use field data collection tool
- Document issue resolution in real time
- Rapid implementation with quick ROI
- Quickly update risk profile and asset strategy
- Organizes and simplifies the collection, workflow, aggregation and reporting of visual inspection data
- Standardizes responses to see trends

Business Case

Visual Inspection with TruQC

Task	Before TruQC	After TruQC
Preparation	60 minutes	10 minutes
Inspection	8 hours (avg)	4 hours
Report Generation	4 hours	5 minutes
Engineer Review	1 hour	1 hour (now real-time updates)
Conflict Resolution	(days)	(hours)
Strategy Update	1 hour	1 hour

Standardization & Digitalization for Visual Inspection for Shipbuilding and Repair

Identified two inspections:

- QA Structural Inspection, New Construction Report
- Compartment Closeout Report



PC76 : Install Cable Protection



PC76 : Ensure Alarm Column in grounded

QA Structural Inspection, New Construction

Inspection ID:	Full:	UBZ:	Location:	PC:	BOC:
Part:		Inspection Date:	Start Time:	End Time:	
<input type="checkbox"/> 2mm Grind		<input type="checkbox"/> Vacuum	<input type="checkbox"/> PWAT		<input type="checkbox"/> ACCEPT <input type="checkbox"/> REJECT

Callout ID: _____

Attribute Code	Description	# Occur	Defect PC	Defect BOC
FT.31.00	Notches			
FT.32.00	Slag			
FT.33.00	Gouges			
FT.34.00	Fabrication scars			
FT.35.00	Opposition is not correct			
FT.36.00	Structure is unfair. Distortion is present			
FT.37.00	Not assembled per drawing			
FT.38.00	Part not fit or parts missing.			
FT.40.00	Burns/Bevels Incomplete			
FT.42.00	Missing Riv Holes			
FT.43.00	Alignment			
FT.44.00	Additional NDT Required			
WL.31.00	Weld wraps are incomplete			
WL.32.00	Weld spatter is not removed			
WL.33.00	Weld contours are improper			
WL.34.00	Arc strikes are not ground			
WL.35.00	Linear discontinuities (weld cracks) are present			
WL.36.00	Porosity is present			
WL.37.00	Undercuts are present			
WL.38.00	End Melts			
WL.39.00	Corner Melts			
WL.40.00	Weld size incorrect			
WL.42.00	Base Metal Repair required			
WL.43.00	Structural welding is not complete			
WL.44.00	Incomplete fusion is present			
WL.46.00	Sharp edges not removed, not properly radius			

Total Discrepancies 0

QA Structural Steel – New Construction Report Lists

Attribute Code/Description

- Notches
- Slag
- Gouges
- Fabrication scars
- Opposition is not correct
- Structure is unfair. Distortion is present.
- Not assembled per drawing.
- Part not fit or parts missing
- Burns/Bevels Incomplete
- Missing Rat Holes
- Alignment
- Additional NDT Required
- Weld warps are incomplete
- Weld spatter is not removed
- Weld contours are improper
- Arc strikes are not ground
- Linear discontinuities (weld cracks) are present
- Porosity is present
- Undercuts are present
- End Melts
- Corner Melts
- Weld size incorrect
- Base Metal Repair required
- Structural welding is not complete
- Incomplete fusion is present
- Sharp edges not removed, not properly radius

Defect PC

- Steel
- Pipe
- Machinist
- Ventilation
- Electrical
- Metal Outfitting
- Paint

Defect SOC

- Planning
- Shops
- Sub Assembly
- Assembly
- Unity/Block Outfitting
- Block Assembly/Outfitting
- On Board
- Testing/System Completion

The screenshot shows a mobile application interface for a QA report. The screen is divided into several sections. At the top, there is a status bar showing the time (2:00 PM), date (Thu Apr 2), and battery level (93%). Below the status bar, there is a header with "Done" on the left and "Document" on the right. The main content area is a form for adding a defect. The form has a title "Remove" and a number "1" next to it. The form fields are: Label (1), Severity, Status, Attribute Code/Description (FT.34.00 - Fabrication scars), Defect PC (73 Pipe), Defect SOC (3 Assembly), Components, Note, Review, and Photos. On the right side of the screen, there is a list of attribute codes with their descriptions. The list is titled "Previous Attribute Code/ Des... Next" and contains the following items: FT.31.00 - Notches, FT.32.00 - Slag, FT.33.00 - Gouges, FT.34.00 - Fabrication scars (checked), FT.35.00 - Opposition is not correct, FT.36.00 - Structure is unfair. Distortion is present., FT.37.00 - Not assembled per drawing., FT.38.00 - Part not fit or parts missing, FT.40.00 - Burns/Bevels Incomplete, FT.42.00 - Missing Rat Holes, FT.43.00 - Alignment, FT.44.00 - Additional NDT Required, WL.31.00 - Weld wraps are incomplete, and WL.32.00 - Weld spatter is not removed.

Compartment Closeout Report Lists

Remove 1 Done

Document

General

Label
1

Title

Severity High Status In Review

Items

Note Review

Photos

Color

Previous Items Next

- Electrical
- Pipe
- Steel/Metal Outfitting
- Vent / Sheetmetal
- Paint
- Machinery
- Ship/Project Management
- Other

Electrical

- Cables
- Hook Ups
- Power
- Wireways
- Connections
- Banding/Packing
- Hardware complete/tight
- Grounding
- Cleanliness
- Tags/Labels

Pipe

- Pads/Gaskets
- Hardware complete/tights
- Hydros/Air/Tightness Systems
- Hotwork
- Cleanliness
- Tags/Labels

Steel/Metal Outfitting

- Hardware complete/tight
- Gaskets
- Hydros/Air Tight
- Hotwork
- Cleanliness
- Tags/Labels

Vent/Sheetmetal

- Screens/Flashing
- Hardware complete / tight
- System Balances
- Hotwork
- Cleanliness
- Tags/labels

Paint

- Overspray Removed
- Touch Up Complete
- Knife Edges Clear
- Color Coding
- Cleanliness
- Tags/Labels

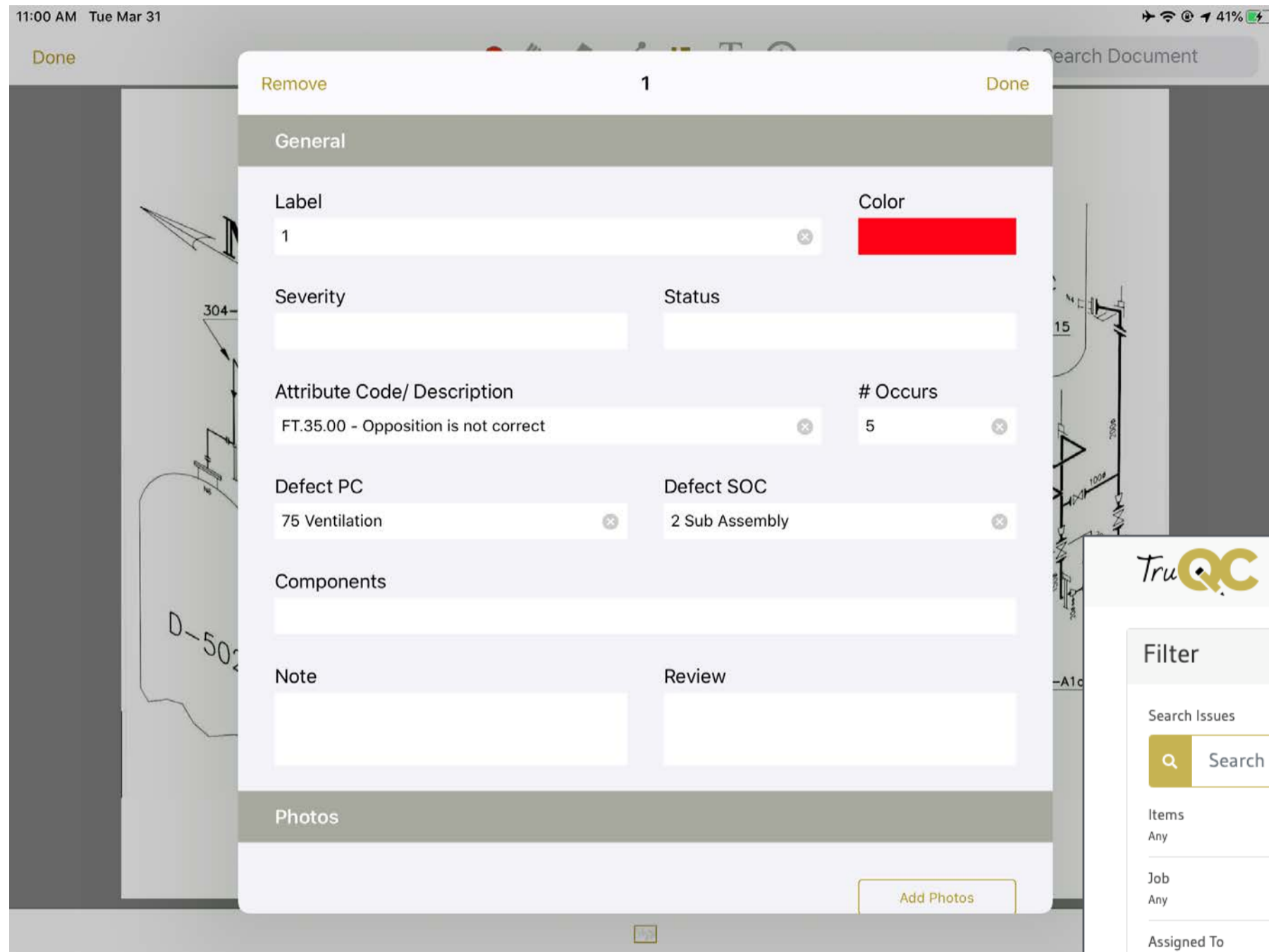
Machinery

- Hardware complete / tight
- Torque Requirements Complete
- System Leaks
- Hotwork
- Cleanliness
- Tags/Labels

Ship/Project Management

- Cards/Discrepancies Cleared
- Testing Complete
- Final Clean

TruQC Capabilities



Issue annotation within Compartment Closeout Report on iPad

Issue Tracking

- Drop dots on documents or photos to track issues to closure

Summaries

- Quickly view all issues reported on all projects and export to Excel

<input type="checkbox"/>	Label	Title	Items	Severity	Status	Creator	Created
<input type="checkbox"/>	1		0 Items			Megan Brinker	03/31/2020
<input type="checkbox"/>	1		0 Items	Low	Open	Megan Brinker	03/31/2020
<input type="checkbox"/>	1		0 Items	Low	Open	Megan Brinker	03/31/2020
<input type="checkbox"/>	1		3 Items	High	Closed	Megan Brinker	03/31/2020
<input type="checkbox"/>	3		0 Items	Medium	Reviewed	Eric Shoyer	03/30/2020
<input type="checkbox"/>	2		0 Items	Low	Closed	Eric Shoyer	03/30/2020
<input type="checkbox"/>	2		0 Items			Pete Ault	03/30/2020
<input type="checkbox"/>	Pete		0 Items	High	In Review	Pete Ault	03/30/2020
<input type="checkbox"/>	1		0 Items	High	In Review	Eric Shoyer	03/30/2020
<input type="checkbox"/>	1		2 Items	Low	Closed	Megan Brinker	03/24/2020
<input type="checkbox"/>	1		2 Items	High	Open	Megan Brinker	03/24/2020
<input type="checkbox"/>	1		0 Items	Low	Open	Tari Hess	03/24/2020
<input type="checkbox"/>	1		0 Items	Low	Open	Megan Brinker	03/11/2020
<input type="checkbox"/>	1		0 Items	Low	Open	Megan Brinker	03/11/2020
<input type="checkbox"/>	1		0 Items	Low	Open	Megan Brinker	03/10/2020
<input type="checkbox"/>	1		3 Items	High	Open	Megan Brinker	03/10/2020
<input type="checkbox"/>	1		0 Items			Megan Brinker	03/09/2020
<input type="checkbox"/>	1		0 Items			Megan Brinker	03/09/2020
<input type="checkbox"/>	1		2 Items	Low	Closed	Megan Brinker	03/09/2020
<input type="checkbox"/>	1		Holidays Paint Defects	High	Open	Megan Brinker	03/09/2020

Issue Tracking tab on TruQC Web App

NSRP SPC Project Update

- **April 2019:** Group brainstorm at Megarust Conference
- **May 2019:** Discussion completed at NASSCO SD
- **September 2019:** Project update meeting in Rhode Island
- **October 2019:** Developed QA Structural Steel Inspection for New Construction
- **November 2019:** Contract Completed
- **February 2020:** Developed QA Compartment Closeout Inspection
- **May 2020:** Received feedback from BAE and NNS
- **June 2020:** Standardizing lists between new build and repair
- **July 2020:** Testing and Paper

Next Up:

- Compiling info from NNS and BAE to make changes
- Final product for testing use
- Writing final paper