https://www.navweld.com

An Intelligent Shipyard Welding Procedure System

SBIR Project
Sponsored by
Office of Naval Research

Weld QC
Quality Control Solutions.

Presentation Outline

- SBIR Project
  - Status
- Follow-on Project

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OBJECTIVE

Reduce the Cost of Developing & Reviewing Welding Procedures for U.S. Shipyards & their Vendors.

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PROJECT TEAM

- WeldQC
- **Northrop Grumman Newport News**
- General Dynamics Electric Boat
- General Dynamics Bath Iron Works

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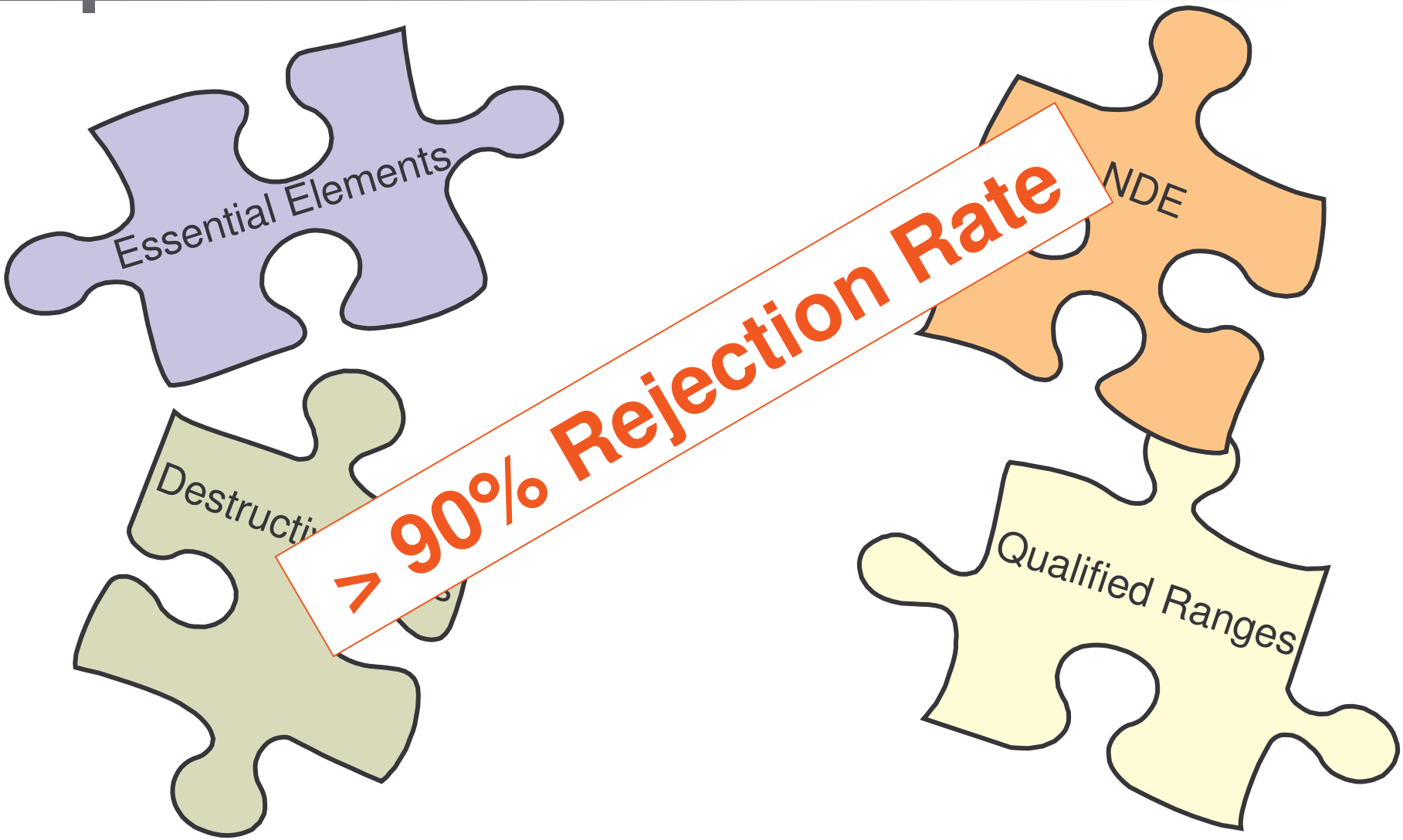
TechPub 248 is Complex



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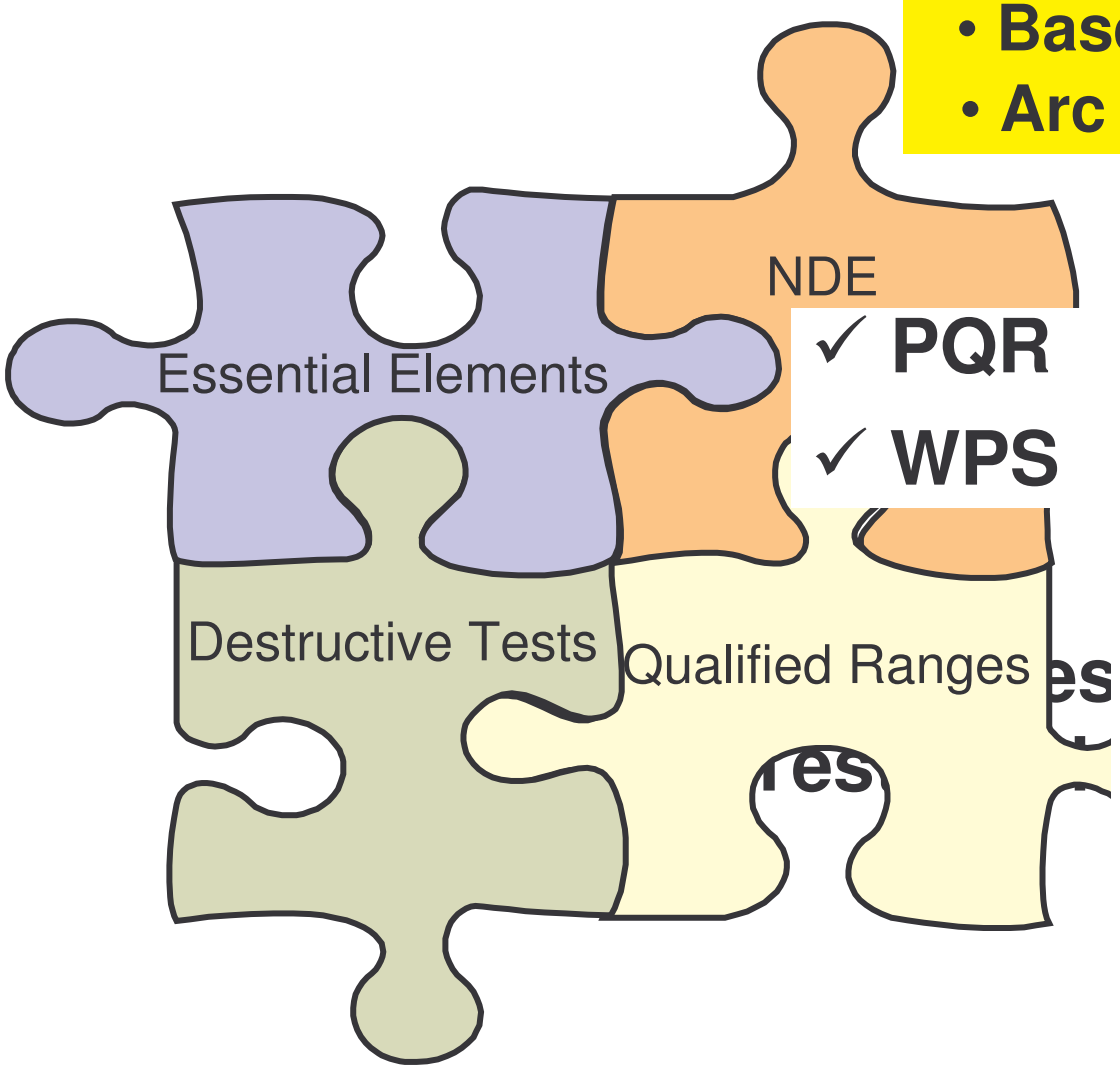
NavWeld

- Based on Tech Pub 248
- Arc Welding Processes



✓ PQR

✓ WPS

✓ Which Tests

✓ Test Entries

✓Allowable Ranges of Essential Elements

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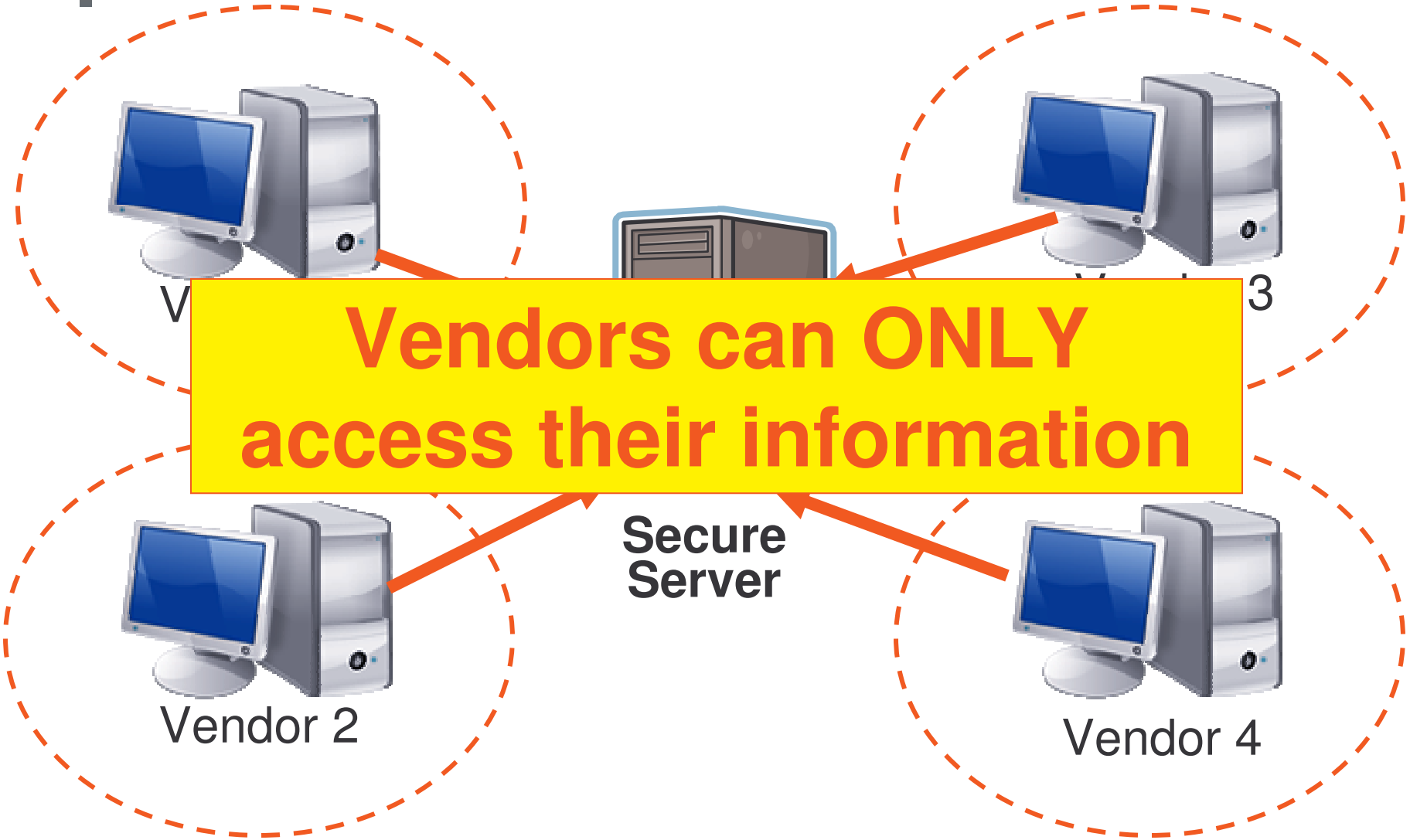
NavWeld – Web Application



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Internet/Intranet Advantages

- Platform Independent (Windows & Apple)
- No software to install
- Updates immediate
- Eliminates version control issues
- Centralized control of users

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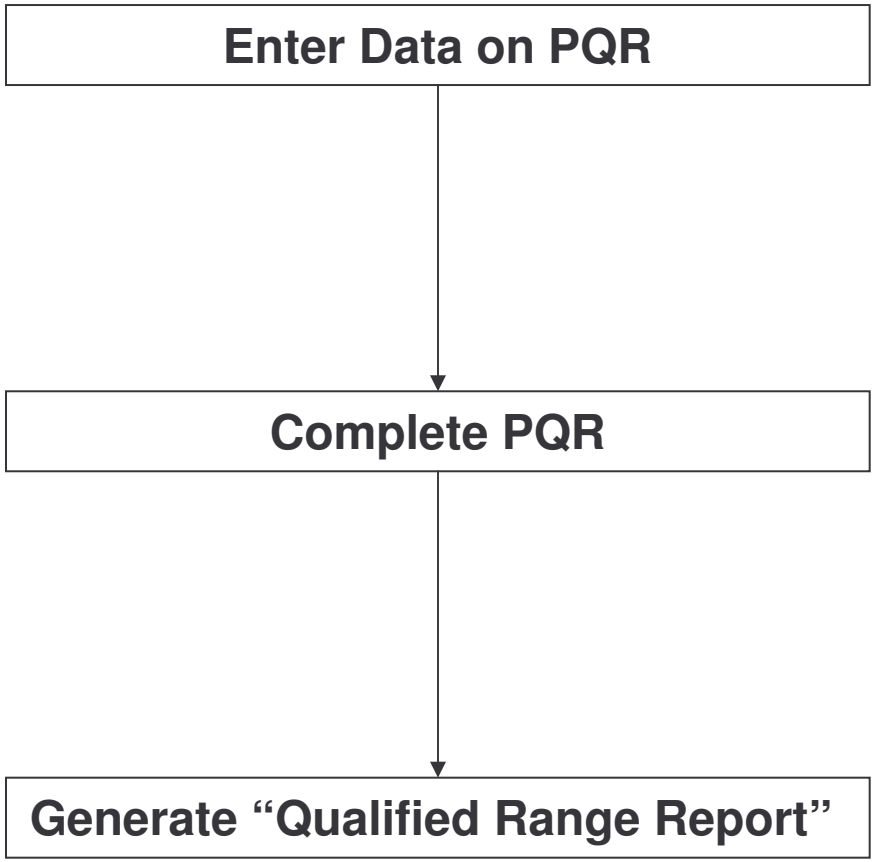
PQR Flowchart



NavWeld Determines

- ✓**Essential Elements**
- ✓ **Non-Destructive Tests**
- ✓ **Destructive Tests**

NavWeld Marks

- ✓**Incomplete Items**

NavWeld Determines

- ✓**Qualified Ranges**

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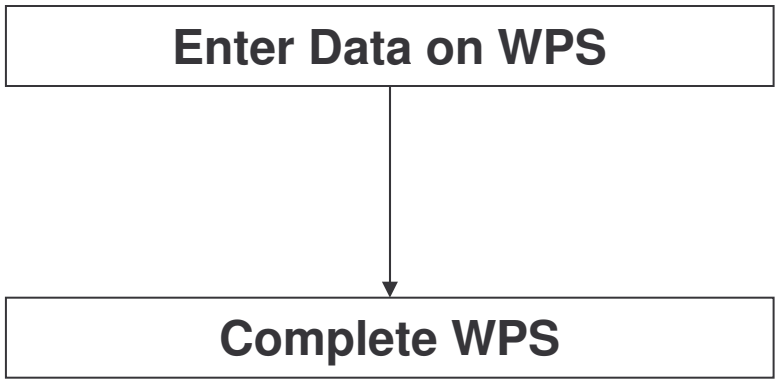
WPS Flowchart



NavWeld Determines

✓**Essential Elements**

NavWeld Marks

✓**Incomplete Items**

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Submittal & Review Flowchart

Generate PDFs

- **PQR**
- **Qualified Range Report**
- **WPS**

↓

Sends PDFs to Shipyard

↓

Reviewer Electronically adds Comments

NavWeld Generates

✓**Standard Format**

NavWeld Marks

✓**Incomplete Items**

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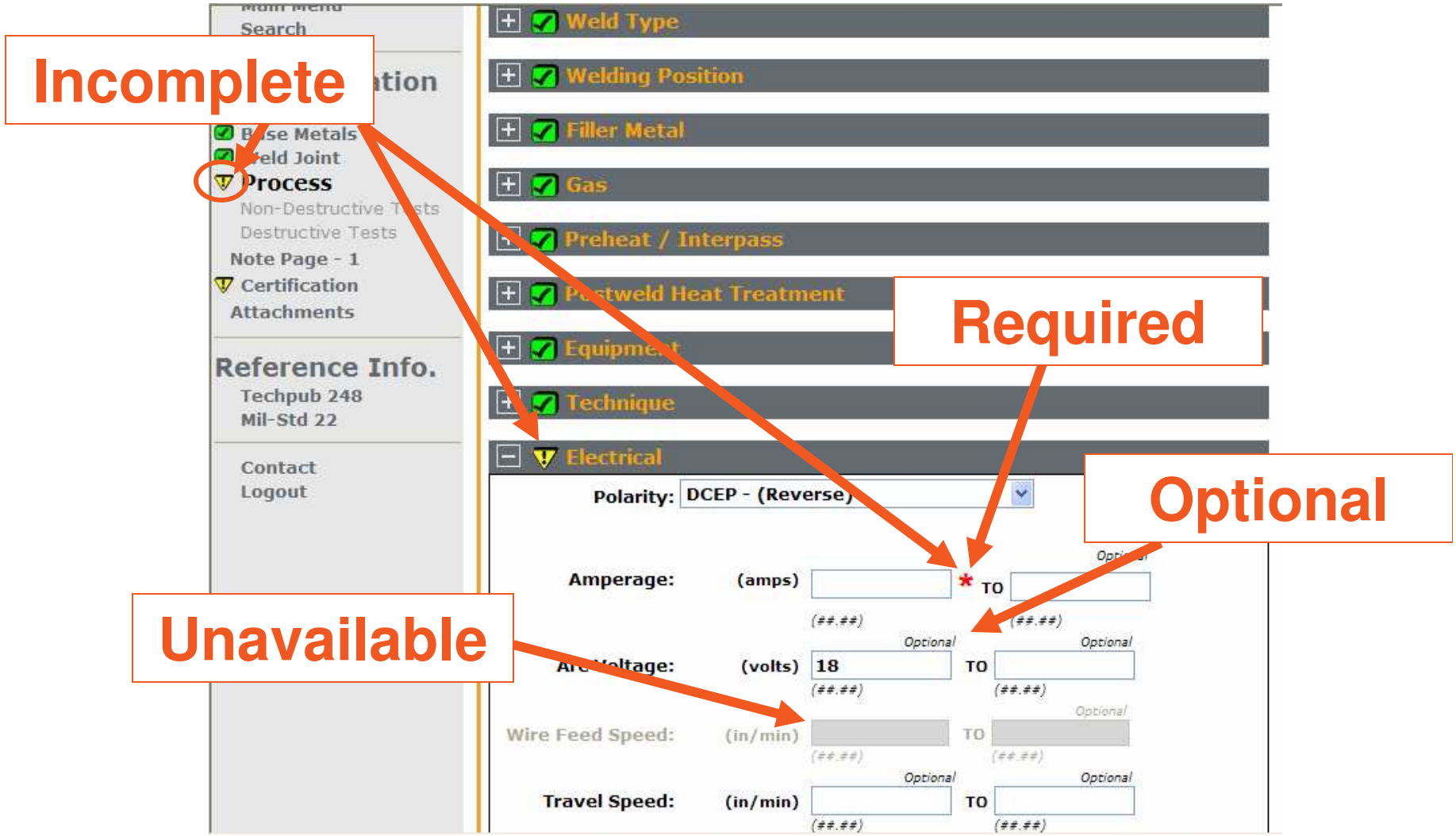
Examples of Vendor Tools

- Indicates which:
  - Essential Elements are required
  - Non-Destructive Tests are required & entries for each test
  - Destructive Tests are required & entries for each test

- "Qualified Ranges" for the Essential Elements based on a PQR

- Provides Tooltips & Help to locate information in TP 248

Essential Elements



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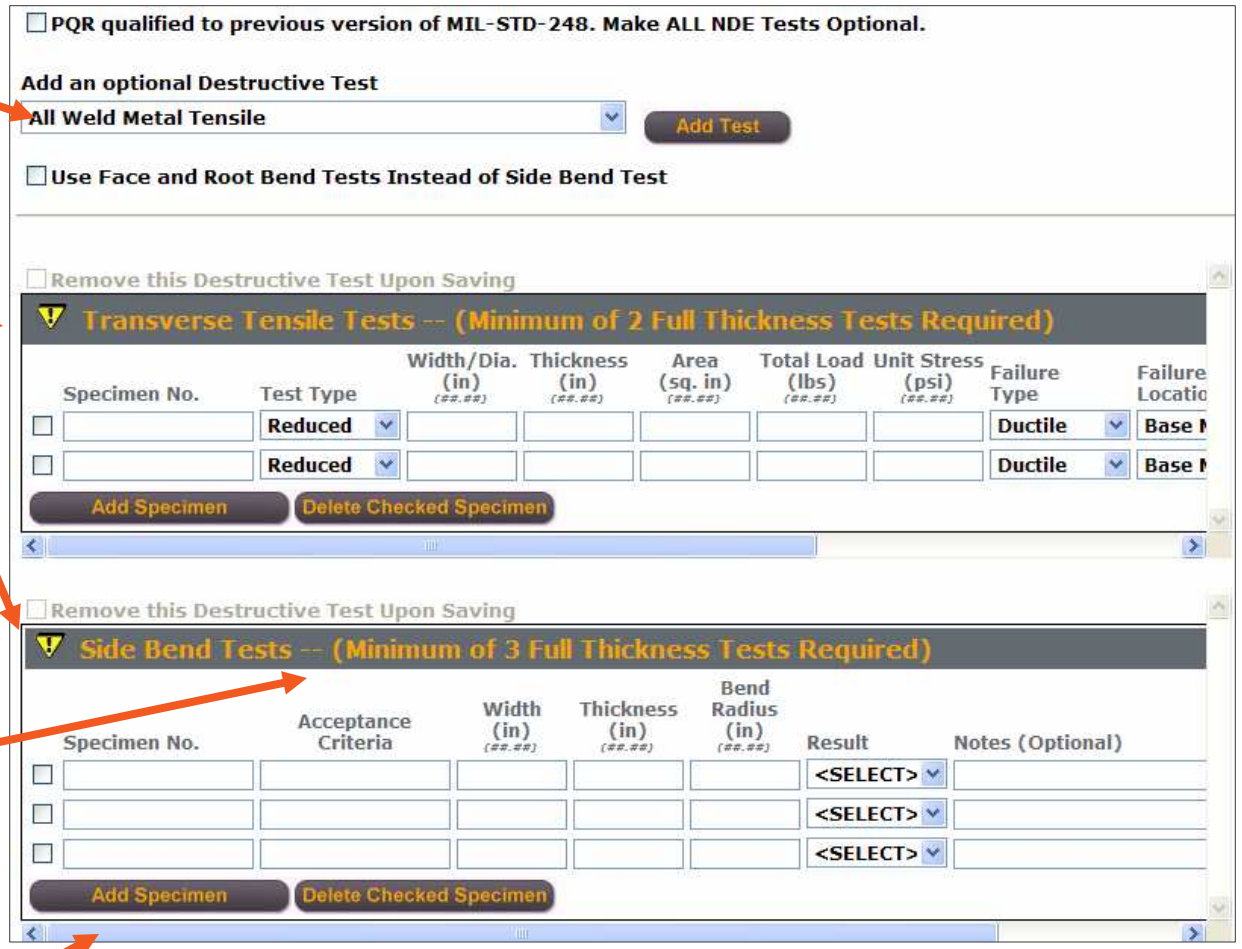
Destructive Tests

Add Optional Tests

Required Tests

No. of Specimens

Add Specimens



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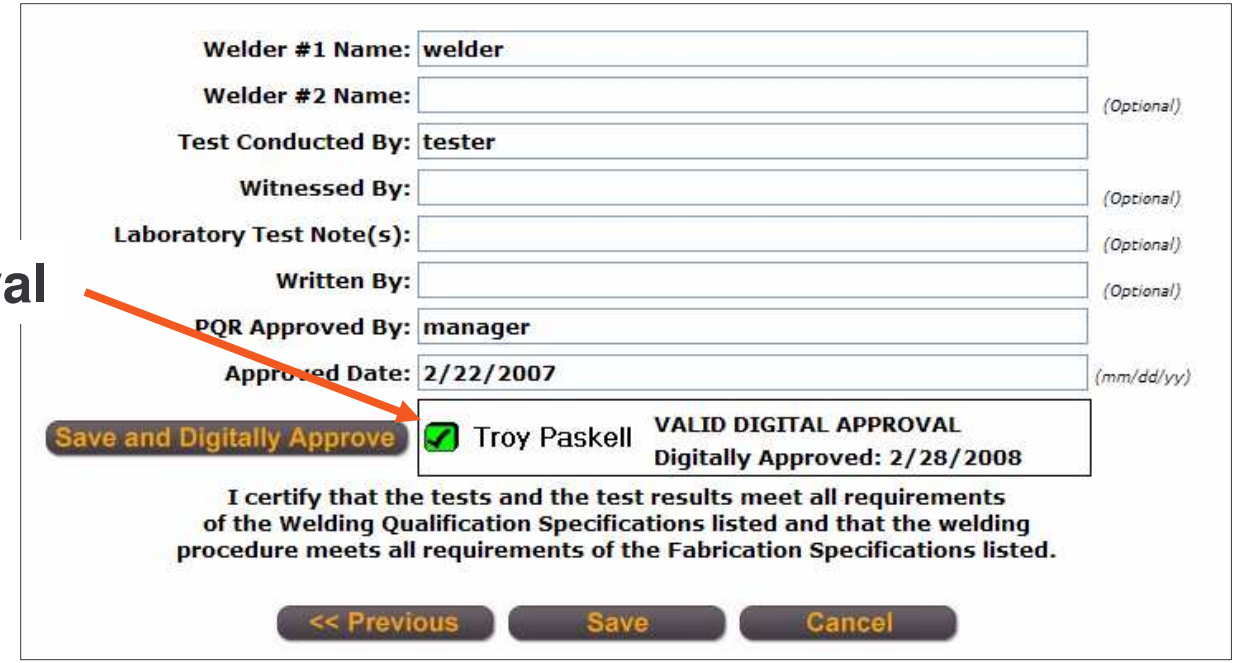
Digital Approval

Valid Digital Approval



Changes causes Invalid Approval

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Qualified Range Report

Level 1 & 2 Qualified Ranges for:

- Essential Elements
- Thickness
- Position
- Base/Filler Metal Cross Qualification

Qualified Range Report

General

	PQR	Level 1 Qualified Range	Level 2 Qualified Range	Tech Pub 248 References	Messages
Welding Process					
Welding Process (WP-1)	GMAW-Pulsed	PQR Value		4.7.4 a-c	
Process Type (WP-2)	Automatic	PQR Value		4.7.4 d & f	
Base Metal					
Base Metal S-No. (BM-1)	S-1	See Base/Filler Table below.			
Filler Metal					
Group No. (A-No.) (FM-1)	A-45B	See Base/Filler Table below.			
Group No. (A-No.) (FM-3)	A-45B	Addition or ommission of supplementary filler is prohibited		4.7.9.3a	
Material Spec (FM-5)	AWS A5.14	See Base/Filler Metal Table below.			
Filler Metal Form (FM-8)	Bare Electrode	See Base/ Filler Metal Table below			
Size of Filler Metal (FM-11)	all: 0.045 (in)	PQR Value +/- 10%		4.7.9.3c	
Size of Filler Metal (FM-12)	all: 0.045 (in)		>0 to PQR Value + 0.015 inch	4.8a	Can decrease electrode size but cannot increase more than 0.015-inch.
Max. Individual Weld Pass (FM-21)	0.1 (in)	0.1			

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Qualified Range Report
Thickness Table

Based on Table 6 & relevant sections of TechPub248

Base Metal Thickness Table for Groove and Fillet Welds

Thickness (T) on PQR used to determine qualified thickness		Qualified Base Metal Thickness [1]			Tech Pub 248 References	Additional Info
		Groove, Autogenous(Groove) [1] & Seal (Groove) Welds		Fillet, Autogenous (Fillet), [1] Socket (Fillet) Welds		
		Pipe (min/max)	Plate (min/max)	Pipe & Plate (min/max)		
Thinnest Base Metal	0.375	0.058 / 2T	0.125 / 2T	0.058 / Unlimited	Table 6 FN2f & Sections 4.4.1.9 & 4.4.2	

1. If multiple rows are shown, use the most stringent.

Base Metal and Weld Metal Deposit Thicknesses for Buildup, Buttering and Repair Welds qualified by Groove Welds.

Thickness (T) on PQR used to determine qualified thickness		Qualified Base Metal Thickness [1]		Qualified Weld Deposit Thickness [1]		Tech Pub 248 References	Additional Info
		Weld Buildup, Buttering & Repair Welds		Weld Buildup, Buttering & Repair Welds			
		Pipe (min/max)	Plate (min/max)	Pipe (min/max)	Plate (min/max)		
Thinnest Base Metal	0.375	0.058 / Unl	0.125 / Unl	0.058 / 2T	0.125 / 2T	Table 6 FN2f & Sections 4.4.1.9 & 4.4.2	

1. If multiple rows are shown, use the most stringent.

Qualified Range Report
Position Table

Based on Table 4 & relevant sections of TechPub248

Welding Position Table

PQR		Qualified Welding Positions [1,2]			TechPub 248 References	Additional Information
Welding Position		Groove, Autogenous (Groove), Seal (Groove), & Weld Surfacing		Fillet, Autogenous (Fillet), & Socket (Fillet)		
		Pipe	Plate	Pipe & Plate		
Welding Position	1G	1GR	1G	1F, 2F		

1. Qualified Welding Positions only apply to the qualified Weld Types above.
2. If multiple rows are shown, use the most stringent.

Qualified Range Report

Base & Filler Table

Based on Table 3 of TechPub 248

Base and Filler Metal Table

	Base Material		Filler Metal	Filler Metal Type	Tech Pub 248 References	Additional Information
	S-No. / Class	S-No. / Class				
PQR	S-8/304L	S-1/Grade C	A-8B	MIL-309		
Qualified	S-8/<ALL>	S-1/<ALL> S-2/<ALL>	A-8B	MIL-309, MIL-310, ER309L	Section 4.7.1c	
Qualified	S-8/<ALL>	S-11A/<ALL>, S-11B/<ALL>, S-11C/<ALL>, S-11D/<ALL>	A-8B	MIL-309, MIL-310, ER309L	Section 4.7.1c	

Help

Contents | Search | - Search - | GO | Powered By RoboHelp®

- Introduction
- How to Begin
- Change Password
- PQR
  - Search Page
  - General Info Page
  - Base Metals Page
  - Weld Joint Page
  - Process Page
  - Non-Destructive Tests Page
  - Destructive Tests Page
  - Certification Page
  - Notes Pages
  - Image Pages
  - Attachments
  - Printing a PQR Report
- Qualified Range Report
- WPS
- Definitions

Face and Root Bend Tests may be substituted for Side Bend Tests by checking the ***Use Face and Root Bend Tests Instead of Side Bend Test*** box, when permitted by S9074-AQ-GIB-010/248. Upon selecting Face and Root Bend Tests, the Side Bend Test becomes Optional and it can be deleted.

Dynamic Tear Tests may be substituted for Charpy Tests by checking the ***Use Dynamic Tear for Toughness Testing***, when permitted by S9074-AQ-GIB-010/248. Upon selecting Dynamic Tear Tests, the Charpy Tests become Optional and they can be deleted.

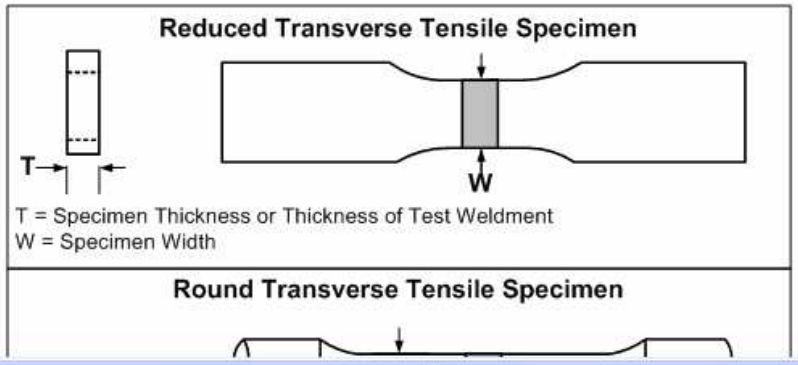
Click on each section for more information.

- ***Transverse Tensile Tests***

  Test Type: The following figure shows examples of the three types of Transverse Tensile specimens.

  NOTE: If the Test Type is Round, the Thickness entry will be shaded, indicating that it is not applicable.

  See AWS B4.0 for the required specimen dimensions and methods for calculating Area, Total Load, and Unit Stress (Ultimate Tensile Strength).



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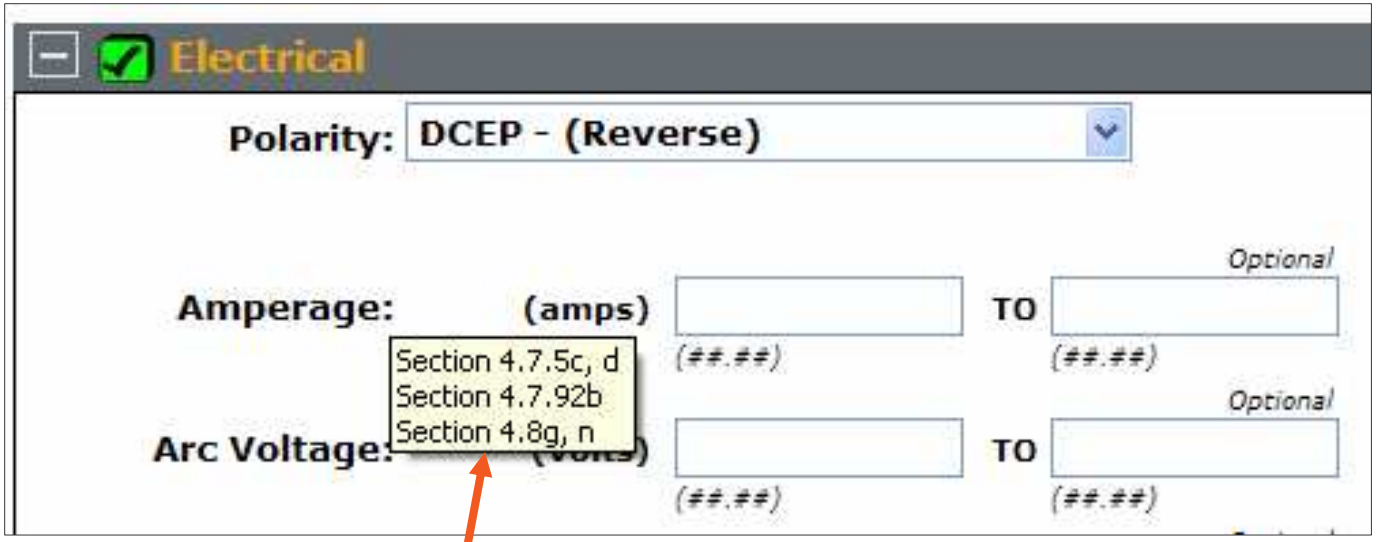
Tooltips



Relevant Sections of TP248

Other Tools

Ability to add:

- Notes Pages
- Images
- Attachments

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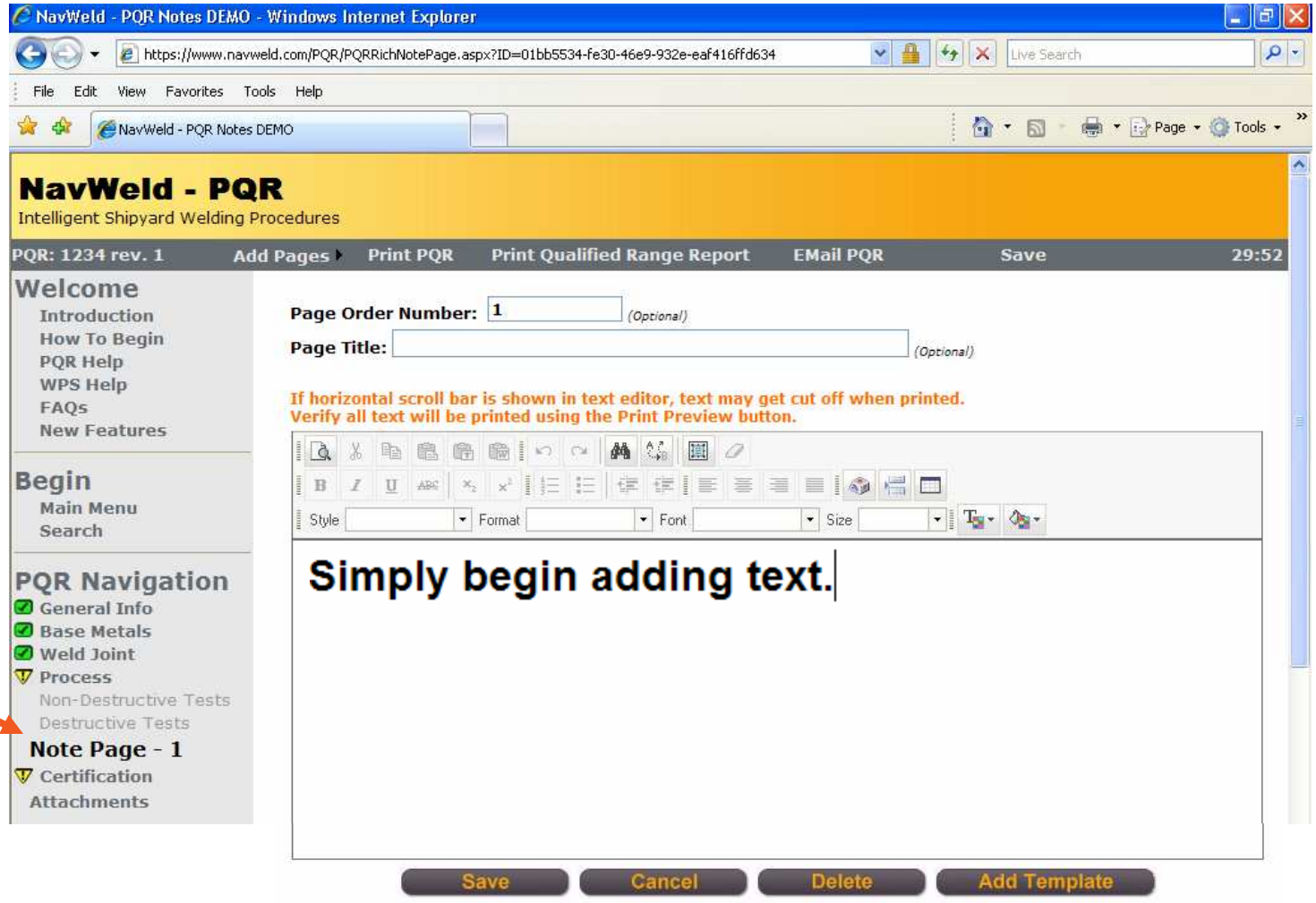
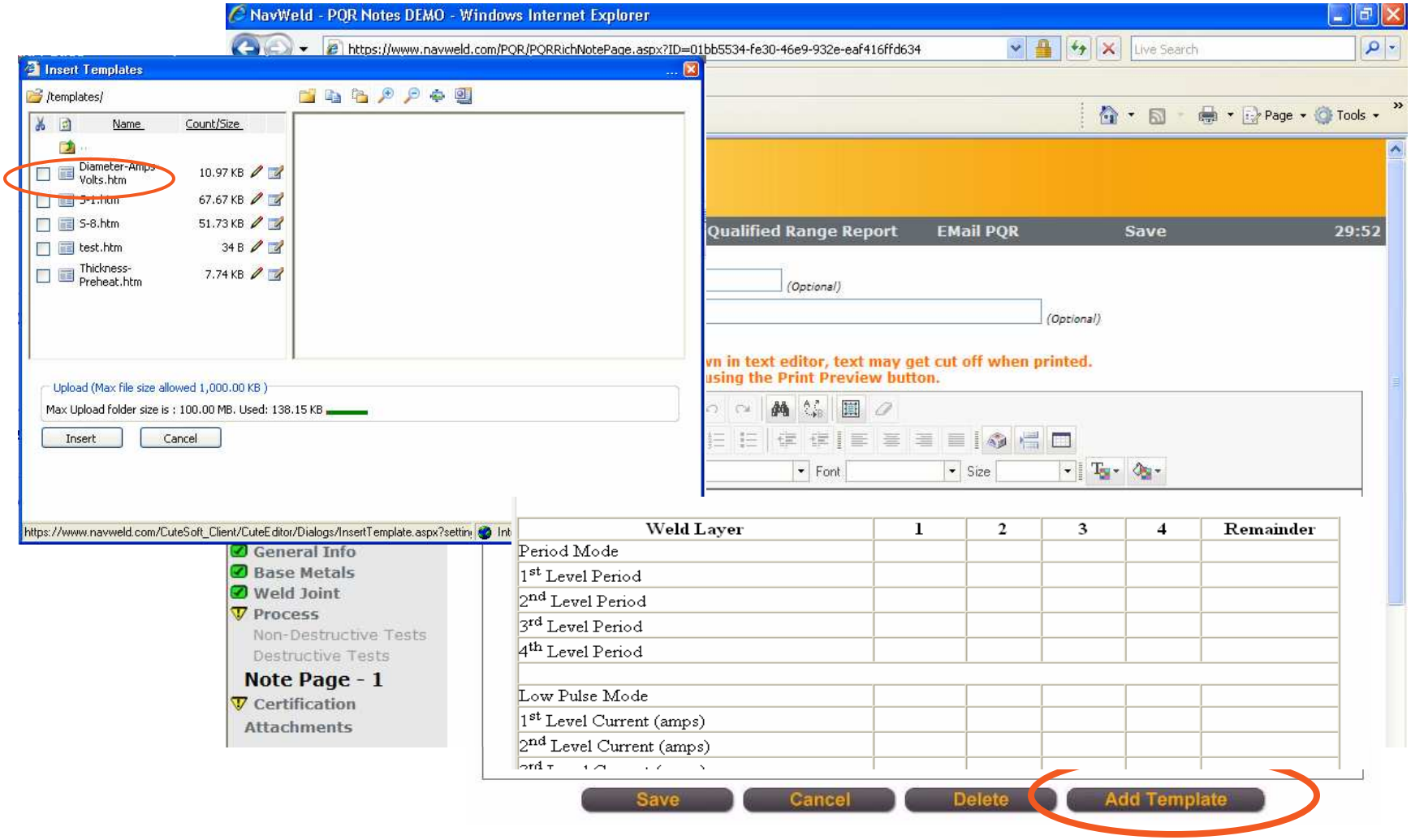
Notes Pages



Notes Pages

Notes Pages
Custom Tables & Templates



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Examples of Reviewer Tools

- **Less Errors by Vendors**
  - Reduces review time
- **Consistent Printed Formats**
  - Makes it easier to find information
- **Dynamic Printing**
  - Prints only the pertinent information
- **Items marked as Incomplete or Complete**
  - Highlights missing information
- **Electronic submission**
  - Electronically add & track review comments

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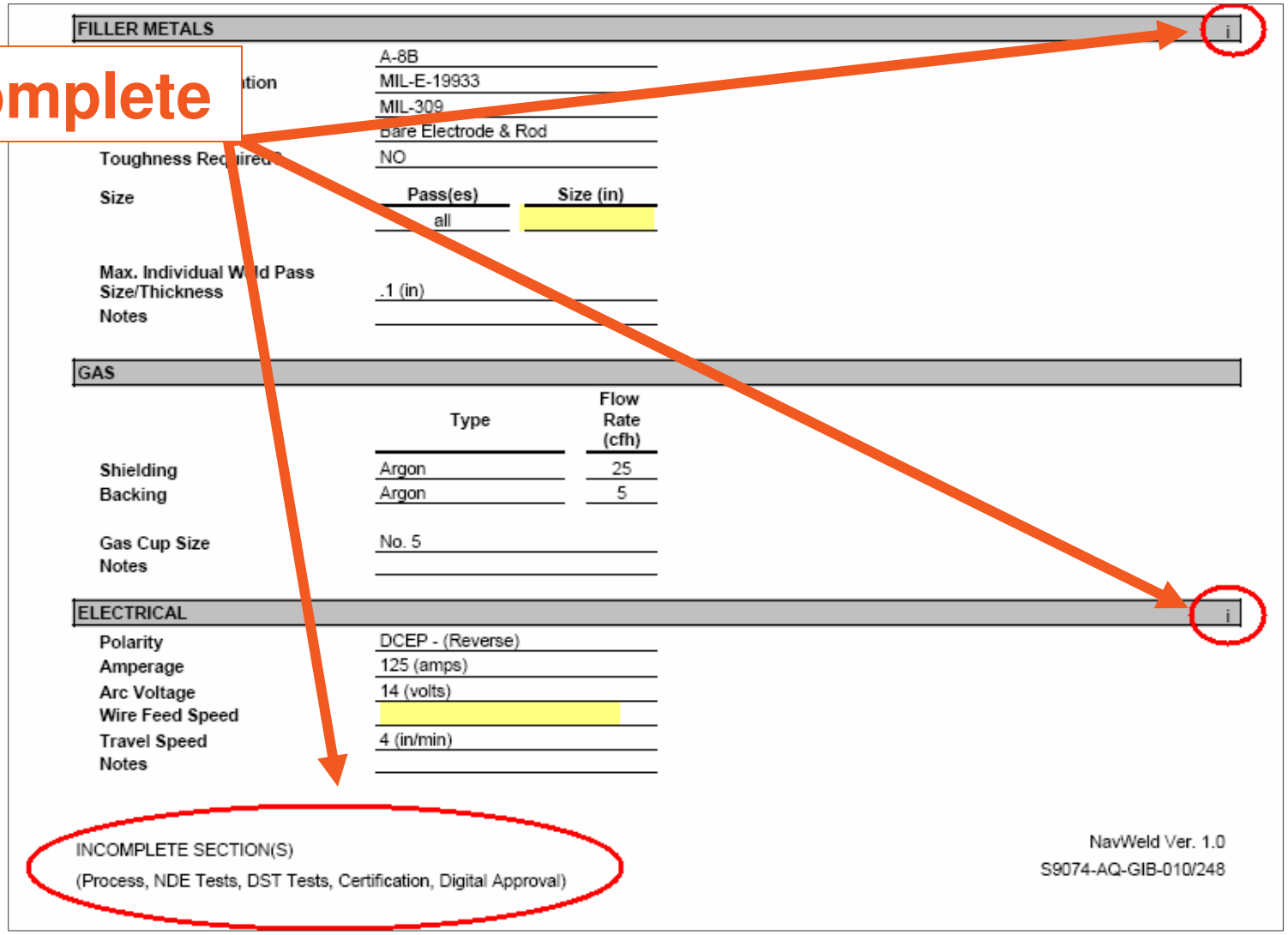
Incomplete Entries on Print Out

Incomplete



FILLER METALS

	A-8B
tion	MIL-E-19933
	MIL-309
	Bare Electrode & Rod
Toughness Required	NO

Size	Pass(es)	Size (in)
	all	

Max. Individual Weld Pass Size/Thickness	.1 (in)
Notes	

GAS

	Type	Flow Rate (cfh)
Shielding	Argon	25
Backing	Argon	5

Gas Cup Size	No. 5
Notes	

ELECTRICAL

Polarity	DCEP - (Reverse)
Amperage	125 (amps)
Arc Voltage	14 (volts)
Wire Feed Speed	
Travel Speed	4 (in/min)
Notes	

INCOMPLETE SECTION(S)

(Process, NDE Tests, DST Tests, Certification, Digital Approval)

NavWeld Ver. 1.0

S9074-AQ-GIB-010/248

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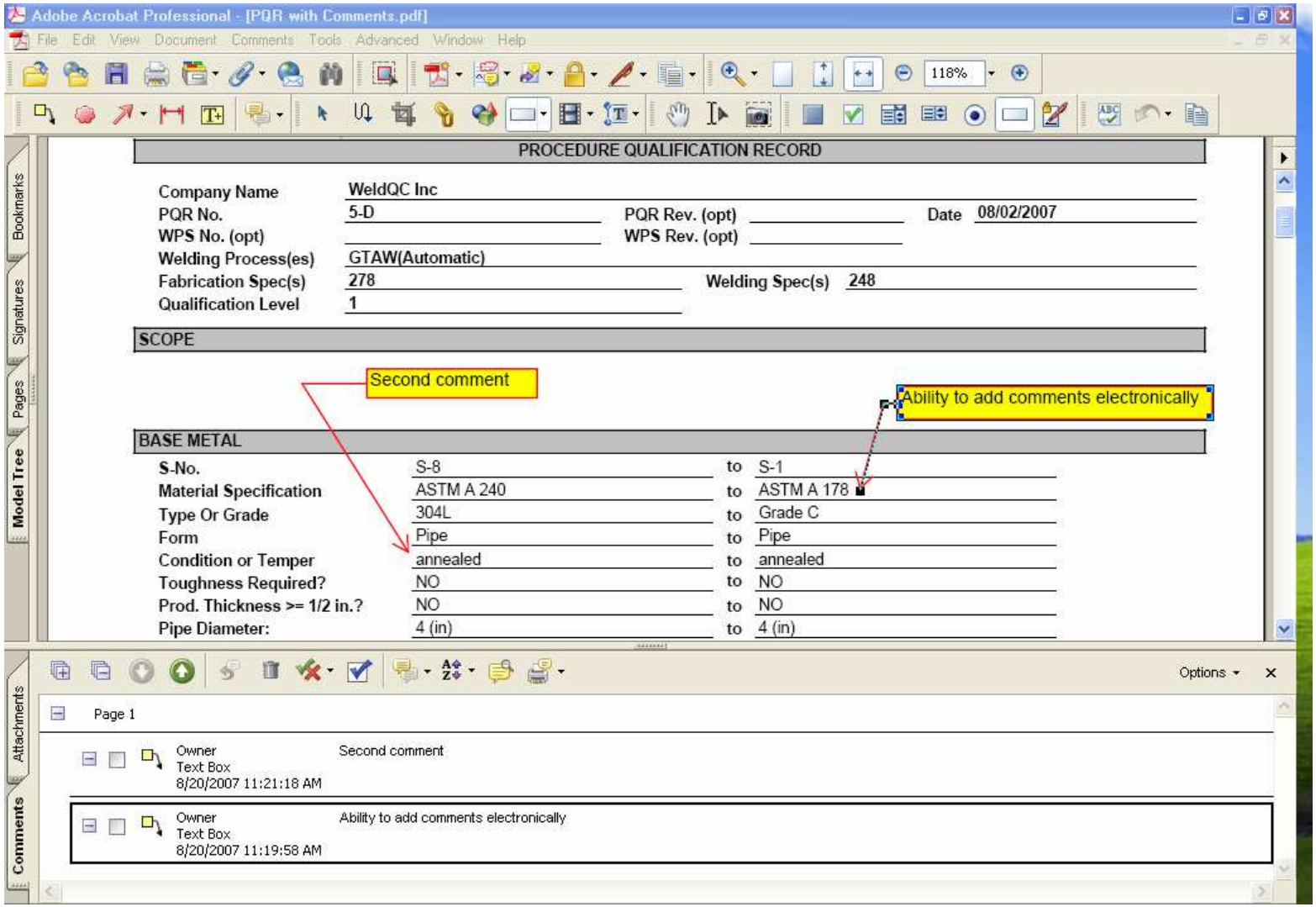
Reviewer's Comments



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SBIR Status

- Completed
- Tested by Project Team
- Seeking additional testers
  - Shipyards
  - Vendors

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Follow-on Project

Web-Based Welding Procedure System for Shipyard Use

Project Team

NAVY MANTECH

CTC Concurrent Technologies Corporation

Program Mgr. Jim Shevock

NMC Navy Metalworking Center

NAVSEA

GENERAL DYNAMICS Electric Boat

NORTHROP GRUMMAN DEFINING THE FUTURE

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Technical Objectives

Add Requirements for:

- Brazing, Resistance & Stud Welding
- ABS-Navy Vessel Rules
- NAVSEA Tech Pub S9074-AR-GIB-010/278
- MIL-STD-1689A
- Welder Performance Qualifications