SO YOU’RE THE NEW WELDING ENGINEER

The Importance of Pre and Post-Weld Operations

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Mike Rice
Sr. Corporate Welding Engineer
The Importance of Pre and Post-Weld Operations

- Pre-Weld Operations
  - Planning
- Post-Weld Operations
  - Review
Pre-Weld Operations

Questions to ask when you are given a job:

What / When / Where / How

- **What** is the scope of work?
  - Code of Construction
  - In House Specifications
  - Customer Specifications
  - Drawings
  - Materials
  - NDE Requirements
Pre-Weld Operations

Questions to ask when you are given a job:

• **When** does fabrication start / to be completed?

• Develop a schedule
Pre-Weld Operations

Questions to ask when you are given a job:

• Where is the fabrication to be performed?
  • In the shop
  • In the field
  • Both in the shop and the field
Pre-Weld Operations

Questions to ask when you are given a job:

• **How** is the fabrication to be performed?

  • Welding equipment
  • Welding consumables
  • Machining equipment
  • Jigs and fixtures
What does this look like in real life?
UREA REACTOR EXTENSION

Belle Plaine, Saskatchewan, Canada
What is the Scope of Work?

• Remove top head

• Attach shell and head extension assembly onto existing shell

• Install internals

• Replace nozzle in the bottom head
Code of Construction

- Structural Carbon Steel – AWS D1.1
- Structural Stainless Steel – AWS D1.6
- Piping – B31.1, B31.3
- Pressure Vessel – ASME Section I, VIII (Div. 1 or 2) Nuclear Section III
- Overseas – ISO
- Government Specification – Federal, Military, DOT, Country Requirements, etc.
Customer Specification

Customers and/or Engineering Firms have additional requirements in addition to Codes

– Acceptable welding processes
  • No FCAW or GMAW

– Welder Qualifications

– Requirements for preheat and interpass

– Requirements for PWHT

– Additional NDE (hardness, chemistry, etc.)
Drawings

Drawings contain a lot of valuable information.

– Dimensions

– Weld joint locations

– Types of joints (Butt – CJP, PJP, Fillet, etc.)

– Code of Construction

– Materials

– NDE
Existing Vessel

Dia: 10.5’
Length: 130’
Thickness: 5 1/8”

Extension

Addition Length: 16’
Total Length: 146’ T/T
Thickness: 4 7/8”
Materials

• SA-724-B (95 ksi tensile strength) Bottom Shell

• SA-240-316L Mod Stainless Steel Liner

• SA-517-B (115 ksi tensile strength) New Top Shell and Head Assembly

• SA-240-S32906 New Liner (Super Duplex)
HEAD REMOVAL

Cut Line

5 1/8” thick
HEAD REMOVAL

• Method to cut the head? (The How?)
  – Oxy-fuel
  – Machine
  – Water Jet
WATER JET CUTTING
WATER JET CUTTING
MACHINING OF WELD PREP
MACHINING COMPLETE
SETTING SHELL VERTICAL
NEW EXTENSION LIFT
NEW EXTENSION LIFT
WELDING PROCESS AND FILLER

• SMAW process
  – Customer driven

• What filler?
  – E9018-D1

• Procedure & Welder Qualification – ASME Section IX.
WELDER QUALIFICATION

• Welders were qualified in Canada to the Canadian Bureau requirements.

• Welders required by customer specifications to successfully pass additional qualifications for the internal welds.

• Required to weld a 5 inch thick test coupon
ID IS COMPLETE
OD IS STARTED
WELDING OD
OD IS COMPLETE
NDE

- MT on backgouge surface
- MT final (ID & OD)
- PT on ID overlay
- Volumetric
  - RT?
  - UT
UT (PHASED ARRAY) ON ID
Post-Weld Operations

Post-Weld Operations – Review of the project. This is a time to learn from the project not a time to beat people over the head.
Post-Weld Operations

Perform a “Lessons Learn” review

• It does not matter the project size

• Within the company

• With the subcontractors

• Customer
Post-Weld Operations

“Lessons Learn” consists of:

• What went well

• What did not go so well

• Action items
Post-Weld Operations

Areas to consider:

- Safety
  - Lost Time accidents
  - Near misses

- Quality
  - Weld reject rate (VT, MT, PT, RT, UT)
  - Meet customer expectations
  - What was done to insure quality
Post-Weld Operations

Areas to consider:

- **Planning**
  - Were drawings adequate
  - Were the specifications clear
  - Additional training needed

- **Tooling**
  - Were the correct tools and quantity on the job?
  - Fixtures
Post-Weld Operations

Areas to consider:

- Welding
  - Correct process used
  - Better process
  - Fit-up
  - Sequence

- Subcontractors
  - Communication
  - What concerns would there be on future projects
  - Why would you use them again
What Made This Project Successful?

• Knowing the job scope:
  – Very clear scope

• Having time to plan:
  – Able to have welders make mock-ups

• Communication:
  – Customer
  – Licensee Engineering firm
  – Canadian Welding Bureau
  – Subcontractors
JOB WELL DONE

Good Job!

Nooter Team

great job - wonderful cooperation and hard work

BB Log
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Ask the key questions:

What / When / Where / How