XXII WELDING/WELD REPAIR AUDIT CHECKLIST

This Process Guideline is divided into eight (8) sections. In most cases, all sections will not apply at one facility. Sections applicable to all types of welding and should be completed in all cases are: I, II, VII and VIII. These sections along with the applicable type process being audited should complete the review.

SECTION I GENERAL (circle one) Sat UnSat N/A

A 1. Does supplier have the necessary welding/welding repair controls and procedures in place to perform on existing contracts?

A 2. Weld Processes Used (check applicable boxes):

Stick MIG TIG Sub Arc Spot Other

Define Other ____________________________

A Weld Procedure Qualifications (check applicable boxes):

A S M E M I L-STD-248 Navy Apprvd Cust Apprvd

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

☐ Other: Define: ________________

A Materials Welded/Weld Repaired (check applicable boxes):

HTS HSLA80 HSLA100

☐ ☐ ☐

HY100 HY80 Stainless/ Nonferrous Mat'I Requiring Preheat/ Interpass Temp. Controls

☐ ☐ ☐

Pipe/ Mach

☐

Other - Define: ________________________________
A 3. Applicable Weld Process Specifications (check applicable boxes):
   ☐   ☐   ☐
   A S M E   MIL-STD-278   PPD694   PPD720   PPD689
   ☐   ☐   ☐   ☐
   S9074-AD-GIB-010/278   T9074-AD-GIB-010/1688
   ☐   ☐
   ☐ Other - Define:

A 4. Procedure Parameters/ Approvals:

   Materials        Required
   Proc Number to be welded   filler material   Approval No:

A 5.a Is there a procedure in place to assure compliance with welding procedures and fabrication documents and are they readily available?
   Yes ☐ No ☐ N/A ☐

A 5.b Is there a QA audit/surveillance procedure in place to weld procedures and fabrication documents?
   ☐   ☐   ☐

A 6. Do travelers/work instructions give detailed welding instructions or refer the welder to applicable documents?
   ☐   ☐   ☐

A 7. Does the supplier invoke all Customer contract/purchase order requirements for welding to his subtier suppliers?
   ☐   ☐   ☐
SECTION II     PROCEDURAL:

A 1. Is there a system to assure that welding (including Tack and Temporaries) is only performed by operators qualified in the procedure and position? Yes No N/A

A 2. Is there a system to assure qualifications are maintained? (MIL-STD-248 Quarterly) (S9074-AR-GIB-010/248) Yes No N/A

A a Is there evidence of annual vision tests? Yes No N/A

A 3. Does the Traveler/Process Sheet/Other Instruction identify each required inspection and NDT? Yes No N/A

A 4. Are contractual records maintained? Sat Unsat

A a. Performance of inspections Yes No N/A
b. Records of defects found Yes No N/A
c. Welder identification where required Yes No N/A
d. Electrodes/Flux Test Report Yes No N/A
e. Qualification and Vision Test Yes No N/A

A 5. Explain/describe records reviewed in regards to clarify, accountability and specification compliance:

A 6. Are there records to assure that electrodes are purchased and issued to the required military specifications? Yes No N/A
A a. Is the weld wire verified for conformance by reviewing certifications for compliance to the applicable Wire Specifications? ☐ ☐ ☐

A b. Are ferritic filler materials chemically analyzed for compliance to applicable Wire Specifications? ☐ ☐ ☐

A 7. Are weld consumables adequately identified, segregated and controlled? ☐ ☐ ☐

A a. In Wire Room and Ovens? ☐ ☐ ☐

A b. While issued to Production? ☐ ☐ ☐

A 7. Is a Wire Chit system in use? ☐ ☐ ☐

A 8. Are electrodes returned to the issuance point? ☐ ☐ ☐

A 9. Does the supplier bake electrodes? ☐ ☐ ☐

A a. Are controls in accordance with applicable specification requirements? ☐ ☐ ☐

A 10. Are Baking/ Holding ovens properly used? (flux and covered electrodes) ☐ ☐ ☐
A 11. Are electrode moisture tests performed?  

A 12. Are Baking/Holding ovens adequately maintained?  

A 13. Does system control compatibility of wire/flux combination to the base material?  

A 14. Is a written procedure in effect describing weld quality and completeness requirements?  

A 15. To what extent is welding process monitoring being done?  

A a  Are all welding attributes and controls reviewed?  Are records kept? Explain:  

A 16. Are workmanship* inspections documented?  

A a  Are detailed records or a more generalized record of accomplishment used? Explain  

A 17. Are weld repair operations, including required evaluations and approvals, properly documented and traceable to the completed material? Explain documentation:
*Workmanship attributes include: weld joint prep, backgouge/grind roots, repair excavation contours, arc strikes, spatter, fabrication scars, alignment and fairness, tapers, snipes, intersecting butts, etc.

SECTION III  FABRICATION WELDING:

A 1. Qualification:
   a. Procedure approved?

A 2. Weld processes used:

A 3. Joint Preparation and Configuration:
   a. Evidence of correct configuration to plans, drawing, fabrication document prior to welding?

A 4. Material to be welded positively identified (traveler, stamped, paint stick, other )?

A 5. Filler material properly identified on work traveler, production Records IAW approved procedure?

A 6. Tack Welding
   a. Evidence of NDT of tack weld if applicable (i.e. MT )
A 7. Preheat used?  
   Yes  No  N/A

A a. Method of preheat (strip heaters, radiant/infrared, torch-gas/air, oxygen-fuel)

A b. Were preheat temperatures monitored?

A 8. Control of Heating:
   Yes  No  N/A

A a. Welding performed within building?

A b. Welding performed outdoors?

A c. Ambient temperature recorded

A 9. Control of Minimum Temperatures:
   Yes  No  N/A

A a. Was a minimum temperature established?

A b. Was MT required due to loss of minimum temperature?

A c. Was MT performed?

A 10. Control of Maximum Temperatures:   
      Yes  No  N/A
A a. Was a maximum temperature established? Yes No N/A

A b. Evidence of maximum temperature monitoring? Yes No N/A

A 11. Temperature Checks:
   a. Was interpass temperature checked? Yes No N/A

A b. Method of temperature checks? Yes No N/A

A c. Was surveillance of preheat temperature checks performed? Yes No N/A

A 12. Weld Repairs for Cracks:
   a. Excavation heat soaking shall be performed after excavation and prior to repair welding. Soaking shall be 350°F minimum for 12 hours minimum.
      (Applicable to HY100 fabrication welding per PPD8026335720 Rev B, [MIL-STD-1668 Rev B] Section 13, Welding Requirements T9074-AD-GI B-010/1688)

A 13. Repairs by Grinding:
   a. Were defects repaired by grinding? Yes No N/A

A b. Was minimum design thickness verified after grinding? Yes No N/A
A 14. Repairs by Welding:
   A a. If yes, was all original weld processes and procedures utilized?

A Filler material used for repair:

A 15. Was arc stud welding utilized?
   A a. Method of stud welding:

A 1. Is the classification of MIL-STD-278 type weld identified? (Para. 3.3.2 of MIL-STD-278)
   A □ Class M  □ Piping Class P-1
       □ Other Class P\(\) (specify)  
       □ Pressure vessels and tanks - Class A  
       □ Steam turbines - Class T

A 2. Is the welding procedure for the type/classification of weld approved?
A  3. Does the filler materials used conform to the requirements of Table III of MIL-STD-278?  

A  4. For Class P thin wall tubing, was the shield metal arc process used? (MIL-STD-278 para 6.2.2 specifies that the process may be used for wall thickness of 0.109 inch or over when welded on board ship or over when welded in the shop. Other welding processes will be permitted for thinner walls on the basis of welding procedure qualification tests) List other processes.

A  5. Does the preheat and interpass temperature for welded ferrous alloys conform to Table IV of MIL-STD-278?  

Review records, travelers, documentation. Specify sample size.

A  6. Does the preheat and interpass temperature for welded non-ferrous alloys conform to Table V of MIL-STD-278?  

Review records, travelers, documentation. Specify sample size.
7. a. For ferrous alloys, was the post heat requirements of Table VI of MIL-STD-278 complied with? □ □ □

b. Was post weld heat treatment performed? □ □ □

c. If performed, do the records, documentation conform to the requirement of Paragraph 8.2 of MIL-STD-278 for special requirements? □ □ □

10. Do records indicate the type of NDT performed? □ □ □

a. Verify the NDT method used is correct for the type/class of welding in accordance with the requirements of MIL-STD-278. RT, MT, PT, UT, VT □ □ □

8. Do records indicate that persons performing NDT are qualified? □ □ □

a. Is the NDT procedure utilized approved by EB, NNS, other? (as specified in the contract?) □ □ □

b List approval documentation reference number □ □ □
<table>
<thead>
<tr>
<th>A</th>
<th></th>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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<td>A</td>
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<tr>
<td>1.a</td>
<td>Is the supplier utilizing MIL-S-11018 filler material to perform weld repairs?</td>
<td>☐</td>
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<td>A</td>
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<tr>
<td>1.b</td>
<td>Is the supplier utilizing automatic/semi-automatic wire (e.g. 100S electrode) to perform weld repairs?</td>
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<td>2.a</td>
<td>Does the supplier procure/utilize precertified MIL-S-1018 filler material?</td>
<td>☐</td>
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<td>A</td>
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<tr>
<td>2.b</td>
<td>Does the supplier certify any weld metals?</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>3.</td>
<td>Is the supplier aware of the repair size limitations (area and depth)?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
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<td>4.</td>
<td>Is the supplier aware that minor repairs defined as any excavation less than or equal to 1/8&quot; or 10% of the plate thickness to a maximum of 0.25&quot; (whichever is greater) and less than 16 square inches?</td>
<td>☐</td>
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<td>5.</td>
<td>Are notations made in plate inspection records for areas repair welded or requiring weld repair? (e.g. size, depth, location)</td>
<td>☐</td>
<td>☐</td>
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</tbody>
</table>
A 6. Are minimum and maximum preheat and interpass temperature requirements being complied with?

<table>
<thead>
<tr>
<th>Minimum Preheat and Interpass</th>
<th>Maximum Preheat Interpass</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/8 and over</td>
<td>200</td>
</tr>
<tr>
<td>&gt;1/2 &lt; 1-1/8</td>
<td>125</td>
</tr>
<tr>
<td>1/2 or less</td>
<td>60</td>
</tr>
</tbody>
</table>

A 7. Does the supplier submit Waiver Requests for defects which exceed the size limits defined above?

B. MS, HTS, HY80, MHSLA80, HSLA100 Plate WELD REPAIRS

A 1. Is the supplier utilizing the appropriate filler material.

A 2. a. Does the supplier procure/utilize precertified filler material?

A 2. b. Does the supplier certify any weld metals?

A 3. Is the supplier aware of the repair size limitations? (Area and depth)

A 4. Is the supplier aware of the definition of minor repairs?
A 5. Are notations made in plate inspection records for areas repair welded or requiring repair? (e.g. size, depth, location)  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
</table>

A 6. Are minimum and maximum preheat and interpass temperature requirements of the fabrication specification being complied with?  

<table>
<thead>
<tr>
<th>Sat</th>
<th>UnSat</th>
<th>N/A</th>
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</thead>
</table>

A 7. Does the supplier submit Waiver Requests for defects which exceed the size limits defined above?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
</table>

SECTION VI. CASTING REPAIRS:  
A. HY100 CASTING REPAIRS  

A 1.a Is the supplier utilizing MIL-S-11018 filler to perform weld repairs?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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</thead>
</table>

1.b Is the supplier utilizing automatic/semiautomatic wire (e.g. 100S electrode) to perform weld repairs?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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</thead>
</table>

A 2.a Does the supplier procure/utilize precertified MIL-S-11018 filler material?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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</table>

2.b Does the supplier certify any welds?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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</thead>
</table>

A 3. Is the MIL-S-11018 filler material utilized by the supplier maintained and controlled by the supplier IAW T9074 AD-GIB-010/1688?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
</table>

A 4. Does the supplier have a workmanship procedure?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
</table>
5. Is the supplier aware of the repair size limitations (area and depth) as denoted in the applicable specification and described below:

Parameters:
Weld repairs in castings shall be interpreted to the Class III standards of NAVSEA 0900-LP-003-9000 (Section 2 does not apply).

Minor Repairs - Repairs of surface defects for which the excavations do not exceed the following:

The maximum depth does not exceed 1/2 inch or 20 percent of the casting thickness, whichever is less, or individual repair areas do not involve more than 2 percent of the casting surface, or the total repair area does not exceed 10 percent of the casting surface.

Nominal Repairs - Repairs which exceed the limitations stated above for minor repairs but do not exceed 2 inches or half the casting thickness in depth, whichever is less. The total accumulated volume of weld metal involved shall not exceed 4 percent of the volume of metal in the casting. Adjacent nominal repairs shall be separated by a distance equivalent to the maximum dimension of the smaller repair or 3/4 inch, whichever is less. If this requirement is not met, the repairs shall be jointed.

Special Repairs - Repairs are those which exceed the limitations stated above for nominal repairs. These repairs are only permitted with prior approval on a case basis. These repairs may include excavations completely through the wall of the casting.

6. Are minimum and maximum preheat and interpass temperature requirements as stated below being complied with?

<table>
<thead>
<tr>
<th>Preheat</th>
<th>Minimum Preheat and Interpass</th>
<th>Maximum Interpass</th>
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<tbody>
<tr>
<td>1-1/8 and over</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>Over 1/2 but less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Than 1-1/8</td>
<td>125</td>
<td>300</td>
</tr>
<tr>
<td>1/2 or less</td>
<td>60</td>
<td>300</td>
</tr>
</tbody>
</table>
A 7. Are weld repairs documented properly? (e.g. size, depth, location, etc.)

III.B  Ferrous and Nonferrous Casting Repairs: (other than HY100

A 1. Is the supplier using the appropriate filler material to perform the weld repair?

A 2. a. Does the supplier procure/utilize precertified filler material?

A 2. b. Does the supplier certify any weld metal?

A 3. Does the supplier have a workmanship procedure?

A 4. Is the supplier aware of the repair size limitations (area and depth) as denoted in the applicable fabrication specification?

Castings:

**Minor Repairs** - Maximum depth does not exceed 20 percent of the casting thickness or 1 inch depth, whichever is less, and individual repair areas do not involve more than 4 percent of the casting surface.

Weld build up for correction of casting dimensions or machining discrepancies not exceeding 10 percent of the
total area of the casting may be made at the discretion of the contractor or when the weld build up is within the following: 3/16 inch maximum build up for wall thickness 1 inch and under or 20 percent of wall thickness maximum build up for wall thickness over 1 inch but not to exceed 3/8 inch.

**Nominal Repairs** - Nominal repairs are repair welds in excess of the above but which do not exceed 1/2 the casting thickness.

**Special Repairs** - Special repairs are those repairs for which excavations of defects are more extensive than those classified as nominal repairs or those that extend through the thickness of the casting or for which the use case inserts may be desired:

**Repair of weld defects**
All visual evidence of arc-strikes, weld or MT prod, shall be removed by grinding and repaired. Discoloration on metal surfaces due to MT inspection shall be disregarded. Excavations resulting from defect removal shall not require repair welding unless the depth and extent of the excavation exceeds the allowable depth and extent of acceptable weld undercut allowed by NAVSEA 0900-LP-003-8000 for the class of welding, or unless any portion of the excavation reduces the remaining metal thickness below the minimum design thickness for the part or weldment.

A 5. Are minimum and maximum preheat and interpass temperature requirements of the fabrication specification being complied with?  

A 6. Are weld repairs documented properly? (e.g. size, depth, location, etc).

A 7. Does the supplier submit Waiver Requests for defects which exceed the size limits above?
SECTION VII  WELDER WORKMANSHIP TRAINING
MIL-STD-248D (para 5.2.3.1), and/or: S9074-AQ-GI B-010/248

A  1. Is there a written procedure covering all aspects of training and associated responsibility? □ □ □

A  2. Is there evidence of approval by the authorized representative as required by Technical Manual S9074-AQ-GI B-010/248, paragraph 5.2.3.1.a of this training procedure? □ □ □

A  3. Is there evidence of training in workmanship and detailed visual inspection requirements of all fabrication documents to which welding is performed? □ □ □

A  4. Have all welders passed written examinations covering detailed workmanship and visual inspection requirements with a grade of 75 percent or greater? □ □ □

A  5. Is there evidence of approval of Items 1, 3 and 4 above by a Level III examiner or other NAVSEA approved individual? (MIL-STD-248, paragraph 5.2.3.1.d) □ □ □

A  6. Do examination records for each welder include: name, fabrication/acceptance standards covered, date of test, and certifying signature of test administrator? □ □ □

A  7. Is each welder retested every 3 years? □ □ □
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<tr>
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<th>Yes</th>
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<tr>
<td>8. Is the entire training program audited by the Level III Examiner or other NAVSEA approved individual (MIL-STD-248, paragraph 5.2.3.1.d) at least once every 2 years to assure adequacy?</td>
<td>□</td>
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**A SECTION VIII PERFORMANCE**

DETAILED OBSERVATION OF WELDERS
(complete one section for each welder observed)

NOTE: If determined to be N/A, provide explanation

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<tr>
<th></th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>a. Welder Identification (name, badge or clock #, shift):</td>
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_________________  ______________  ____

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<tr>
<td>b. Wire Chit on file (in-house system):</td>
<td>□</td>
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<th>Yes</th>
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<td>c. Welding Process observed:</td>
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<td>d. Base Material(s) being welded:</td>
<td>□</td>
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<th>Yes</th>
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<tr>
<td>e. Is the welder qualified for observed welding procedure?</td>
<td>□</td>
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<td>□</td>
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<thead>
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<th></th>
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<tr>
<td>f. Is the welder familiar with details of the procedure?</td>
<td>□</td>
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<tr>
<td>g. Is procedure/ technique sheet readily available?</td>
<td>□</td>
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<th></th>
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<tr>
<td>h. Procedure Number:</td>
<td>□</td>
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<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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<tbody>
<tr>
<td>i. Electrode/ Filler Wire/ Flux in use:</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
A 1. Type

A 2. Specification

A j. Material Identification: On records _____

A On hardware _____

A k. Parameters: Yes  No  N/A

A 1. Current

A 2. Voltage

A 3. Travel Speed

A 4. Wire Size

A l. Joint Preparation, Fitup and Clean

A m. Visual Weld Quality and Workmanship

A n. Is preheat/interpass required? Yes  No  N/A

A 1. Is preheat temperature compliance checked?  

A 2. Is interpass temperature range confirmed?  

A o. Overall, is operator complying with procedure and specifications?  

A p. Are required documents organized in an orderly manner? (e.g. procedure and mods, Approval documents, etc., in one accessible location)?  

Additional Comments/Concerns