

# Inspection PRIOR to Welding

#	Item	YES	NO	N/A
<b>1</b>	<b>Welding Personnel Qualified</b>			
	4.1.2: Welders employed under AWS D1.1 <b>shall</b> be qualified by the applicable tests as described in Part C, Section 4			
	4.1.3: Period of Effectiveness: (1) weld in qualified process within 6 months; (2) specific reason to question ability			
	6.4.1: Only qualified welders allowed to weld by AWS D1.1 or demonstration of ability approved by Engineer to 4.1.2.1			
<b>2</b>	<b>Welding Equipment Suitable</b>			
	5.11: Welding-cutting equipment <b>shall</b> be designed & manufactured to attain the results desired by AWS D1.1			
	6.3.2: Inspector <b>shall</b> inspect equipment to ensure it conforms to the requirements of 5.11			
<b>3</b>	<b>Proper Welding Materials selected</b>			
	5.3.1.1: When requested, Contractor <b>shall</b> furnish certification that electrode/flux combination conforms to AWS D1.1			
	6.2: Contractor's Inspector <b>shall</b> make certain that only materials conforming to the requirements of this code are used			
<b>4</b>	<b>Proper Storage of Welding Materials</b>			
	5.3.1.4: Welding materials opened <b>shall</b> be stored and protected so that the welding properties are not affected			
	5.3.1.5: Electrodes <b>shall</b> be dry and in suitable condition for use			
	5.3.2: Electrodes for SMAW <b>shall</b> conform to the requirements of the latest edition of AWS A5.1 or AWS A5.5			
	5.3.3: SAW Electrodes & Fluxes may be performed with multiple electrodes & combinations			
	6.2: Contractor's Inspector <b>shall</b> make certain that only materials conforming to the requirements of this code are used			
<b>5</b>	<b>Shielding Gas Type (if used)</b>			
	5.3.1.3: Dew point of -40(F or C) or lower & certification of gas provided upon request & % of gases conform to the WPS			
	6.2: Contractor's Inspector <b>shall</b> make certain that only materials conforming to the requirements of this code are used			
<b>6</b>	<b>Proper WPS Selected for Joint Detail</b>			
	3.6: Limitations of WPS Variables; procedure pre-qualified; available; changes per: amps, volts, travel speed, gas flow			
	5.3.1.2: Variables: electrode, arc length, volts, amps suited for thickness, correct ranges, type of groove, position, etc...			
	5.5: Variables conform to WPS; each pass complete fusion; VT acceptable; inform welders in proper use, WPS followed			
	6.5.2: Inspector <b>shall</b> make certain only WPS's are employed which meet the provisions of AWS D1.1 Sections 3 or 4			
<b>7</b>	<b>WPS Settings (Voltage, Polarity, Current, Wire Speed) on Welding Equipment</b>			
	5.5: Variables conform to WPS; each pass complete fusion; VT acceptable; inform welders in proper use, WPS followed			
	6.5.3: Inspector make certain electrodes used are for proper positions and current/polarity for which they are classified			
	6.5.4: Inspector, at intervals: joint prep, assembly, welding technique, performance, requirements of AWS D1.1 are met			
<b>8</b>	<b>Shielding Gas Flow Rate Setting</b>			
	6.5.4: Inspector, at intervals: joint prep, assembly, welding technique, performance, requirements of AWS D1.1 are met			
<b>9</b>	<b>Fit of Parts</b>			
	5.22: Tolerances for Joint Dimensions are met: gaps, alignment, root opening, groove angle/radius, depth of groove, etc.			
<b>10</b>	<b>Fit of Backing Bar (if used)</b>			
	5.10: Thickness to prevent melt through; full length of weld; weld fused to bar; removed per Spec's			

	5.22.1.1: Separation not to exceed 1/16"; filler plates prohibited unless approved by Engineer per Section 2.13			
<b>11</b>	<b>Root Opening and Groove Angle within Joint Tolerance and WPS Tolerance</b>			
	5.22.4: Tolerances per Section 5.3 or Engineer approval; corrections by weld repair by Engineer approval			
	5.22.5: Grooves by gouging dimensions per Fig. 3.3/4; 3.12.3, 3.13.1			
<b>12</b>	<b>Condition of Steel Surface</b>			
	5.15: Surfaces smooth, uniform, free from fins, tears, cracks, loose or thick scale, slag, rust, moisture, grease			
	6.2: Contractor's Inspector <b>shall</b> make certain that only materials conforming to the requirements of this code are used			
<b>13</b>	<b>Weld Joint Surfaces Free from Discontinuities</b>			
	5.15: Surfaces smooth, uniform, free from fins, tears, cracks, loose or thick scale, slag, rust, moisture, grease			
<b>14</b>	<b>Existing Tack Welds Clean and of Adequate Quality</b>			
	5.18.2: Same quality as final welds; removed (flush) when required by Engineer; location per type of load, appearance			
<b>15</b>	<b>Environmental Conditions and Ambient Temperature</b>			
	5.12.2: No welding; (1) below 0F; (2) wet surfaces; (3) high wind velocities; (4) personnel exposed to inclement conditions			
<b>16</b>	<b>Wind Velocities within Limits</b>			
	5.12.1: GMAW, GTAW, EGW or FCAW-G <b>shall</b> not be done in draft or wind unless protected; wind less than 5 mph			
<b>17</b>	<b>Minimum Preheat Applied (if required)</b>			
	5.6: Preheat base metal per WPS/Table 4.5; combination of materials - higher preheat; maintain throughout welding; check			
<b>18</b>	<b>Maximum Preheat Verified (if applicable)</b>			
	Per Contract: check Project Specifications; Drawings; WPS; Engineer direction			

## Inspection DURING Welding

#	Item	YES	NO	N/A
<b>1</b>	<b>WPS Followed (volts; current; wire feed speed, travel speed, stickout, gas flow rate, pass location, etc.)</b>			
	5.5: Variables conform to WPS; each pass complete fusion; VT acceptable; inform welders in proper use, WPS followed			
	5.21: Control of Distortion-Shrinkage: sequence of passes; weld progression, restraint, splices, temperature limitations			
	6.5.3: Inspector – electrodes used in correct positions & with correct current and polarity			
	6.5.4: Inspector, at intervals: joint prep, assembly, welding technique, performance, requirements of AWS D1.1 are met			
<b>2</b>	<b>Control of Welding Materials Exposure Maintained</b>			
	5.3: Certification; suitability per WPS; Shielding Gas per WPS; Storage; Condition; Low Hydrogen; Atmosphere, Flux			
	6.2: Contractor's Inspector <b>shall</b> make certain that only materials conforming to the requirements of this code are used			
<b>3</b>	<b>Minimum Interpass Temperature Maintained</b>			
	5.6: Preheat base metal per WPS/Table 4.5; combination of materials - higher preheat; maintain throughout welding; check			
<b>4</b>	<b>Maximum Interpass Temperature Satisfied</b>			
	Per Contract: check Project Specifications; Drawings; WPS; Engineer direction			
<b>5</b>	<b>No Detrimental Change to Environmental Conditions</b>			
	5.12.1: GMAW, GTAW, EGW or FCAW-G <b>shall</b> not be done in draft or wind unless protected; wind less than 5 mph			
	5.12.2: No welding; (1) below 0F; (2) wet surfaces; (3) high wind velocities; (4) personnel exposed to inclement conditions			
<b>6</b>	<b>Proper Technique Used (Electrode Angle, Stringer Beads, etc...)</b>			

	5.21: Control of Distortion-Shrinkage: sequence of passed; weld progression, restraint, splices, temperature limitations			
	6.5.4: Inspector, at intervals: joint prep, assembly, welding technique, performance, requirements of AWS D1.1 are met			
<b>7</b>	<b>Interpass Cleaning Satisfactory</b>			
	5.30.1: In process – all slag removed, weld & adjacent base metal brushed clean			
	6.5.4: Inspector, at intervals: joint prep, assembly, welding technique, performance, requirements of AWS D1.1 are met			
<b>8</b>	<b>Interpass Profiles Satisfactory</b>			
	5.24: Figure 5.4 – size; convexity; undercut, overlap; fusion; transition on unequal thicknesses; underfill			
	6.5.4: Inspector, at intervals: joint prep, assembly, welding technique, performance, requirements of AWS D1.1 are met			
<b>9</b>	<b>Weld Passes Meet Quality Requirements</b>			
	6.5.4: Inspector, at intervals: joint prep, assembly, welding technique, performance, requirements of AWS D1.1 are met			
	6.9: All welds <b>shall</b> be visually inspected and <b>shall</b> be acceptable if the criteria of Table 6.1 are satisfied			
<b>10</b>	<b>NDT, In Process</b> (when required)			
	Per Contract: check Project Specifications; Drawings; WPS; Engineer direction			

## Inspection After to Welding

#	Item	YES	NO	N/A
<b>1</b>	<b>Fabricated Member Within Tolerance</b>			
	5.23: Straightness; camber; sweep; web flatness, distortion; centerlines match, flange warpage/tilt; depth variation; twist			
<b>2</b>	<b>Inspection Delay Period Satisfied</b> (if required)			
	6.11: Not less than 48 hours after completion of welds for: ASTM A514; A517; A709 Gr 100 & 100W			
	Table 6.1 (5): as 6.11 for Statically, Cyclically Non Tubular connections and all Tubular connections (Appendix M)			
<b>3</b>	<b>Weld Cleaned</b>			
	5.30.2: Final – clean all slag from weld, brush weld and adjacent base metal, spatter acceptable unless directed otherwise			
<b>4</b>	<b>Weld Free of Cracks</b>			
	Table 6.1 (1): all cracks <b>shall</b> be unacceptable regardless of size or location			
	6.5.5: Inspector to examine work to meet AWS D1.1 requirements. Other acceptance criteria per Engineers approval.			
<b>5</b>	<b>Weld Size and Length Verified</b>			
	5.13: Size & length <b>shall</b> be no less than specified by design requirements & drawings & Table 6.1 or Engineer approval			
	6.5.5: Inspector to examine work to meet AWS D1.1 requirements. Other acceptance criteria per Engineers approval.			
	Table 6.1 (6): Undersize < 10%, web-flange underrun less than 2X flange thickness; 3/16-1/16; 1/4-3/32; > 5/16-1/8			
<b>6</b>	<b>Weld Profile within Limitations</b>			
	5.24: Figure 5.4 – size; convexity; undercut, overlap; fusion; transition on unequal thicknesses; underfill			
	6.5.5: Inspector to examine work to meet AWS D1.1 requirements. Other acceptance criteria per Engineers approval.			
	Table 6.1 (4): Weld profiles per 5.24: convexity; concavity; undercut; underfill; overlap; reinforcement (< 1/8); surface finish			
<b>7</b>	<b>Weld Appearance Indicates Thorough Fusion</b>			
	Table 6.1 (2): Thorough fusion <b>shall</b> exist between adjacent layers of weld metal and between weld metal and base metal			
<b>8</b>	<b>Weld Crater Acceptable</b>			
	Table 6.1 (3): All craters <b>shall</b> be filled to provide specified weld size (except intermittent fillet weld outside effective length)			
<b>9</b>	<b>Undercut within Limitations</b>			

	Table 6.1 (7): Base Metal < 1": 1/32" max.; < 1/16" for any 2" in any 12"; Base Metal => 1": < 1/16 for any length			
<b>10</b>	<b>Porosity within Limitations</b>			
	Table 6.1 (8.a): (STATIC LOAD) CJP butt joints transverse to TS – NONE; Other welds: >1/32" < 3/8" in 1"L or 3/4" in 12"L			
	Table 6.1 (8.b): (CYCLIC LOAD-TUBULAR) Fillet welds: 3/32" dia., <1 in 4"; Stiffeners: < 3/8" in 1"L or 3/4" in 12"L			
	Table 6.1 (8.c): (CYCLIC LOAD-TUBULAR) CJP butt joints transverse to TS – NONE; Other welds: 3/32" dia., <1 in 4"			
<b>11</b>	<b>Arc Strikes Checked &amp; Ground</b>			
	5.29: outside the area of permanent welds should be avoided; Cracks-blemishes <b>shall</b> be ground smooth & checked			
<b>12</b>	<b>Backing Bars Removed (if required)</b>			
	5.10.4: (Cyclically Loaded): Transverse to Stress <b>shall</b> be removed; Parallel to Stress no unless specified by Engineer			
	5.10.5: (Statically Loaded): no unless specified by Engineer			
<b>13</b>	<b>Weld Tabs Removed (if required)</b>			
	5.31.2: (Statically Loaded): no unless specified by Engineer			
	5.31.3: (Cyclically Loaded-Nontubular): <b>shall</b> be removed & ends of weld ground smooth & flush with adjacent base metal			
<b>14</b>	<b>Weld Surface Contour (if required)</b>			
	5.24: Figure 5.4 – size; convexity; undercut, overlap; fusion; transition on unequal thicknesses; underfill			
<b>15</b>	<b>Surface Finish (if required) chipping &amp; gouging may be used, followed by grinding</b>			
	5.24.4.2: Roughness <b>shall</b> not exceed 250 micro"; 125-250 micro" areas parallel-primary stress; 125 micro" any direction			
<b>16</b>	<b>NDT Completed (if required)</b>			
	Per Contract: check Project Specifications; Drawings; WPS; Engineer direction			
<b>17</b>	<b>Inspection Mark Completed</b>			
	6.5.6: Inspector shall identify all parts or joints inspected & accepted			
<b>18</b>	<b>Documentation Completed</b>			
	6.5.7: Record welder quals; welding operators; tack welders; WPS quals or other tests; other information as required			