



Case Study

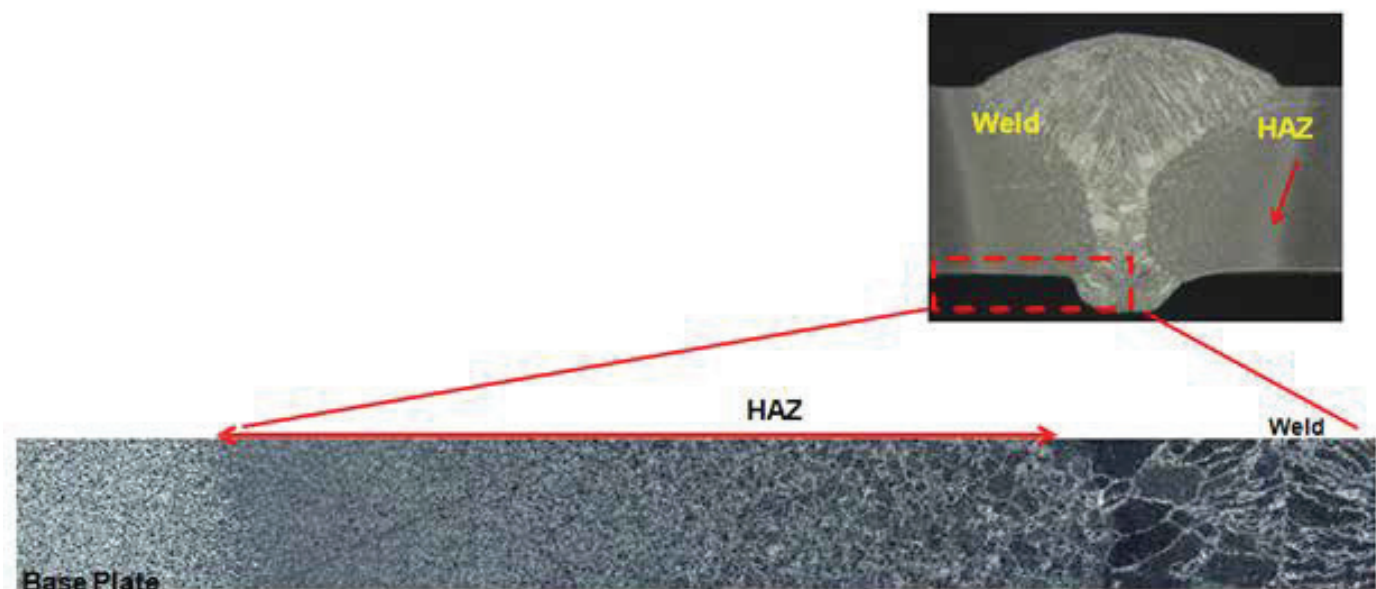
0.25" steel (AH36) Butt Welding In Root Opening, No Prep

Welding Parameters

Plasma/ GMAW Weld ID#	Plate Angle/ .035 Inch Root Opening	Plasma Arc Parameters			GMAW Parameters					
		Current Amps	Volts	Heat Input KJ/inch	Wire Dia (inch)	Wire Feed Rate In/ min	Travel Speed inch/mm	Volts	Current Amps	Heat Input KJ/in
LIN113		140	22	7	0.0625	225	26.6	24.5	380	21
LIN116		140	21.8	7	0.0625	225	27.8	24.5	378	20
LIN119		140	21.2	7	0.0625	225	26.2	24.5	392	22

Table 1 – Plasma/GMAW Single-V Welding Parameters used to join 0.25" thick A-36 Steel Plate with a .035" Root Opening

Welding Effects on the Heat Affected Zone



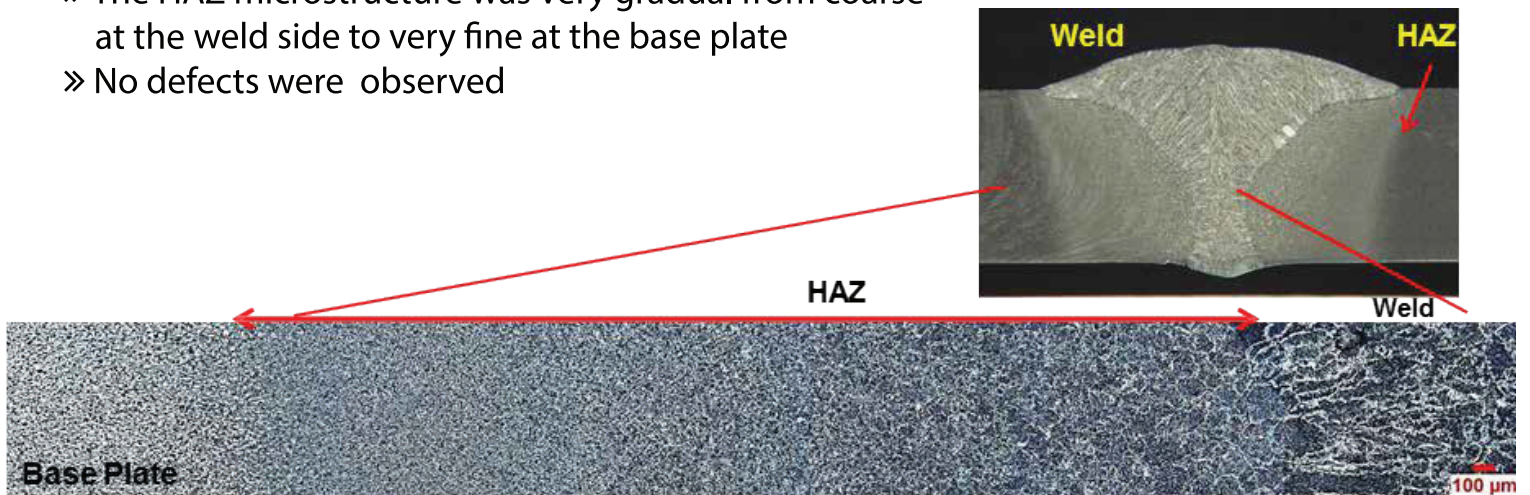
Weld A36-LIN119 – Machined plate edges, as rolled mill scale on root and face sides



Welding Effects on the Heat Affected Zone

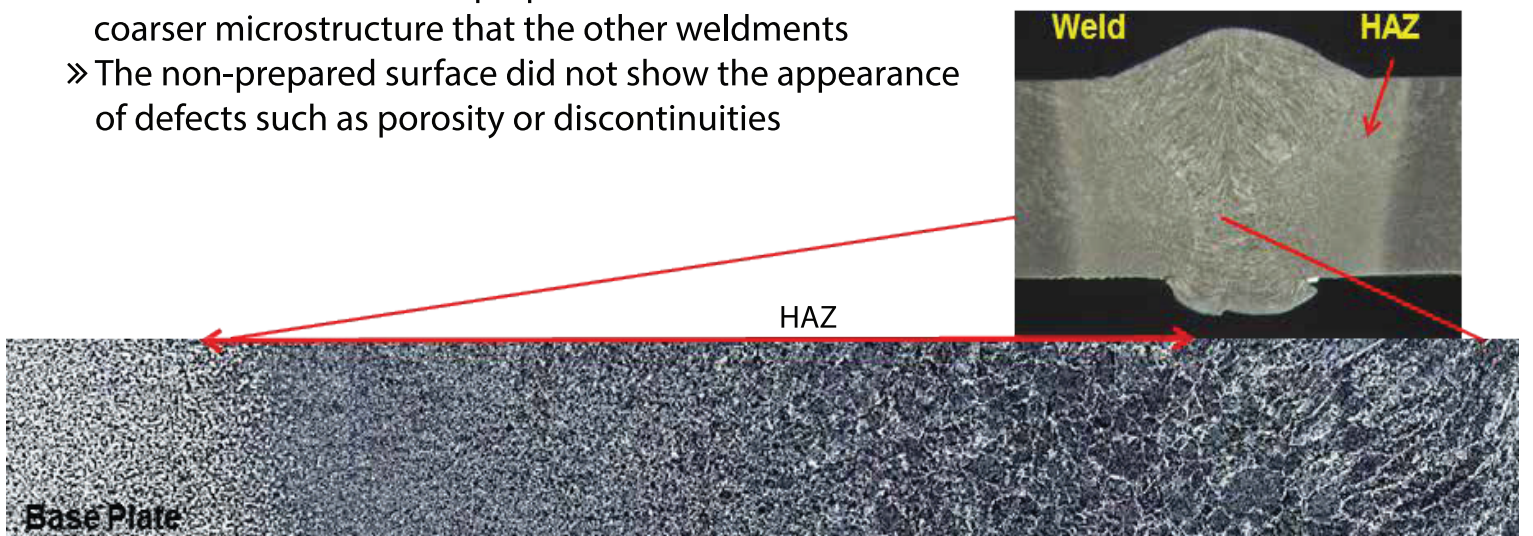
Weld A36-LIN113- Machined edges, all surfaces cleaned

- » Very diffused and wide HAZ was observed
- » The HAZ microstructure was very gradual from coarse at the weld side to very fine at the base plate
- » No defects were observed



Weld A36-LIN116- As rolled (no preparation)

- » This weldment without preparation had a HAZ with a coarser microstructure than the other weldments
- » The non-prepared surface did not show the appearance of defects such as porosity or discontinuities





Tensile Properties

Plasma/GMAW Weld ID #	0.2% Yield Strength, ksi	Ultimate Tensile Strength, ksi	Elongation %
LIN113 – 90° Angle, Machined Edges, All Surfaces Cleaned	58.8± 0.5	78.4± 0.2	19.4 ± 1.5
LIN116 – As Rolled (no prep)	56.6± 0.3	77.0± 0.2	18.1± 3.3
LIN119 - 90° Angle, Machined Edges, As Rolled Mill Scale on Root and Face Sides	56.2± 0.1	77.0± 0.4	22.5± 0.2
AWS ER70S-6 As-welded AWS Specification	51.0 min	70.0 min	22 min.
A-36 Steel Plate	51.0 min	71.0 min	22 min.

Table 2 – tensile properties summary

Conclusions:

Hybrid plasma/GMAW welding of 0.25" AH-36 offers the advantages of high quality welds, with no material prep.

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