PETROLVALVE CLADDING ISSUE

GE imagination at work

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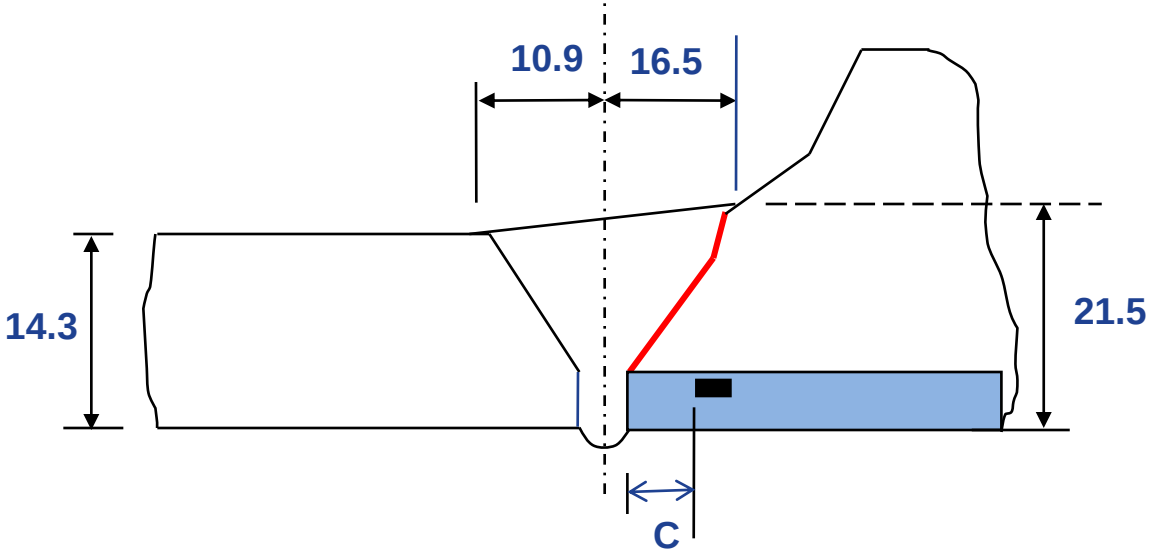
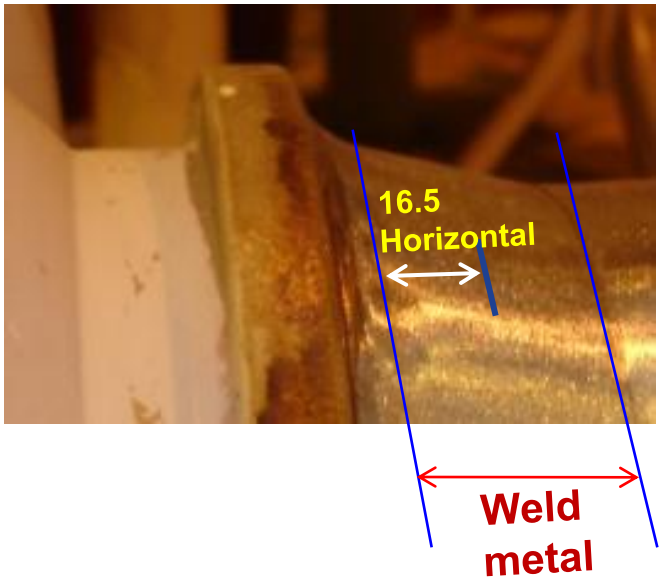
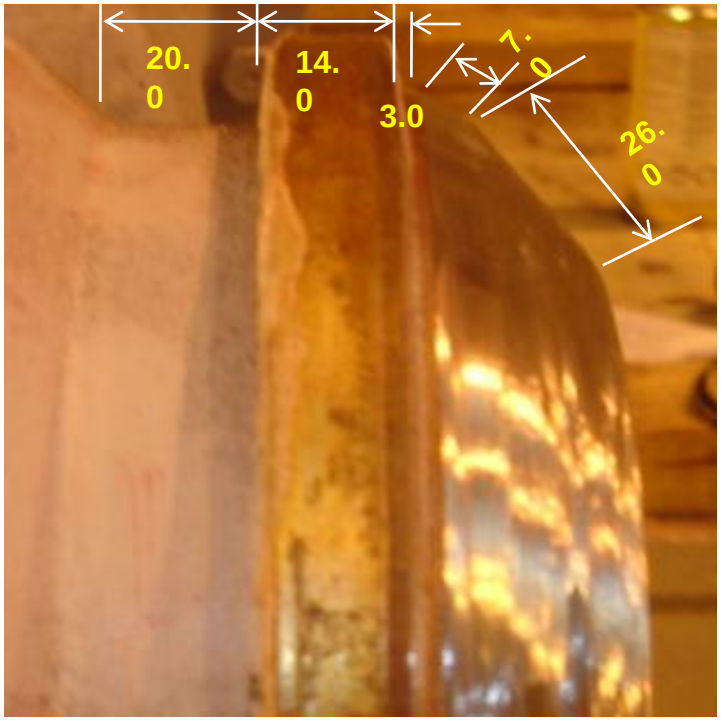
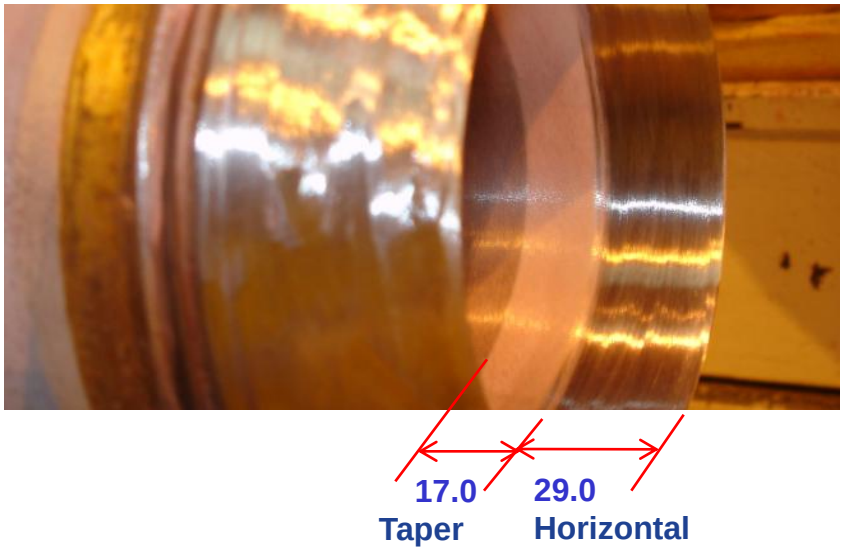
CSWIP 3.2
AWS – SCWI

vetcogray
a GE Oil & Gas business









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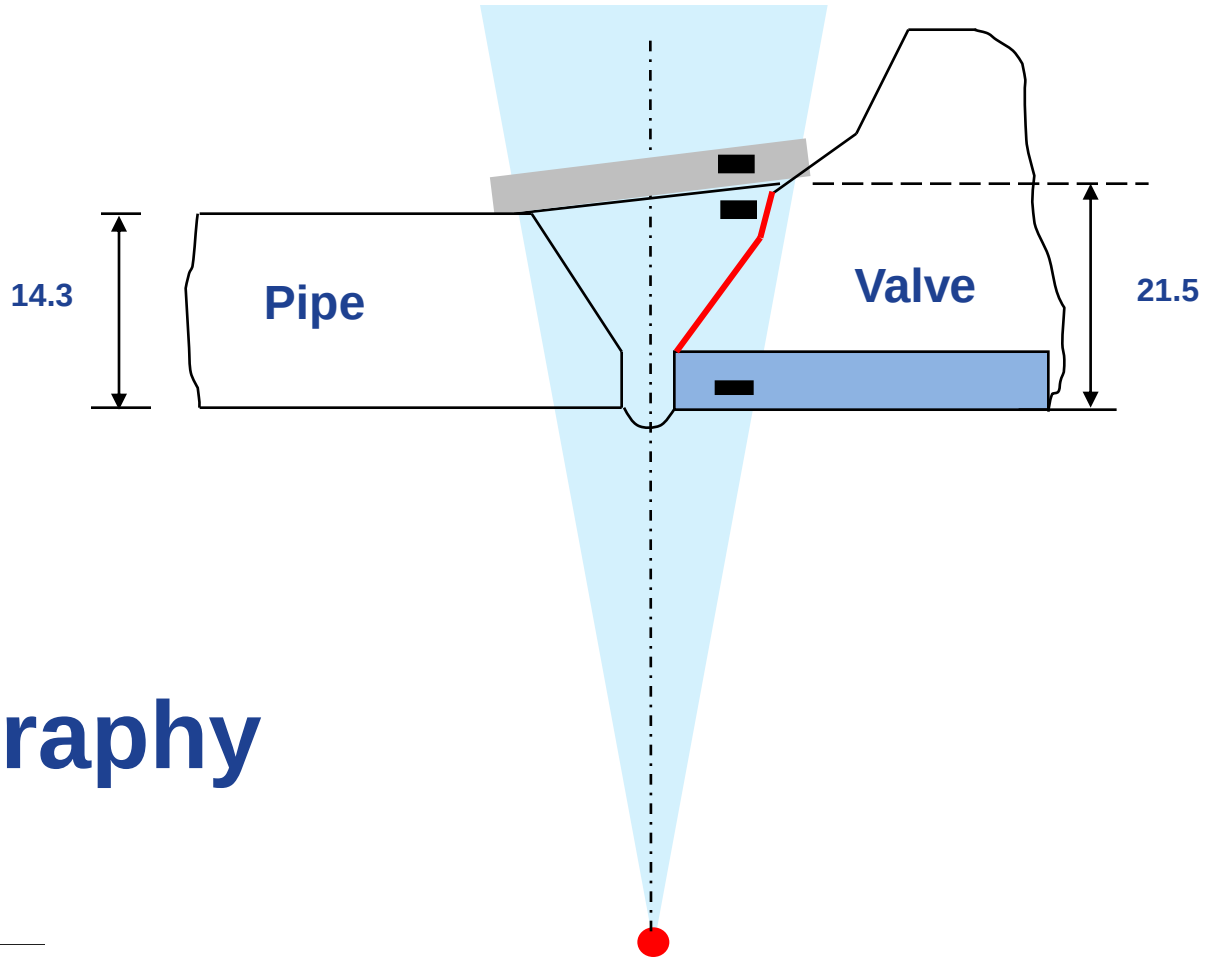
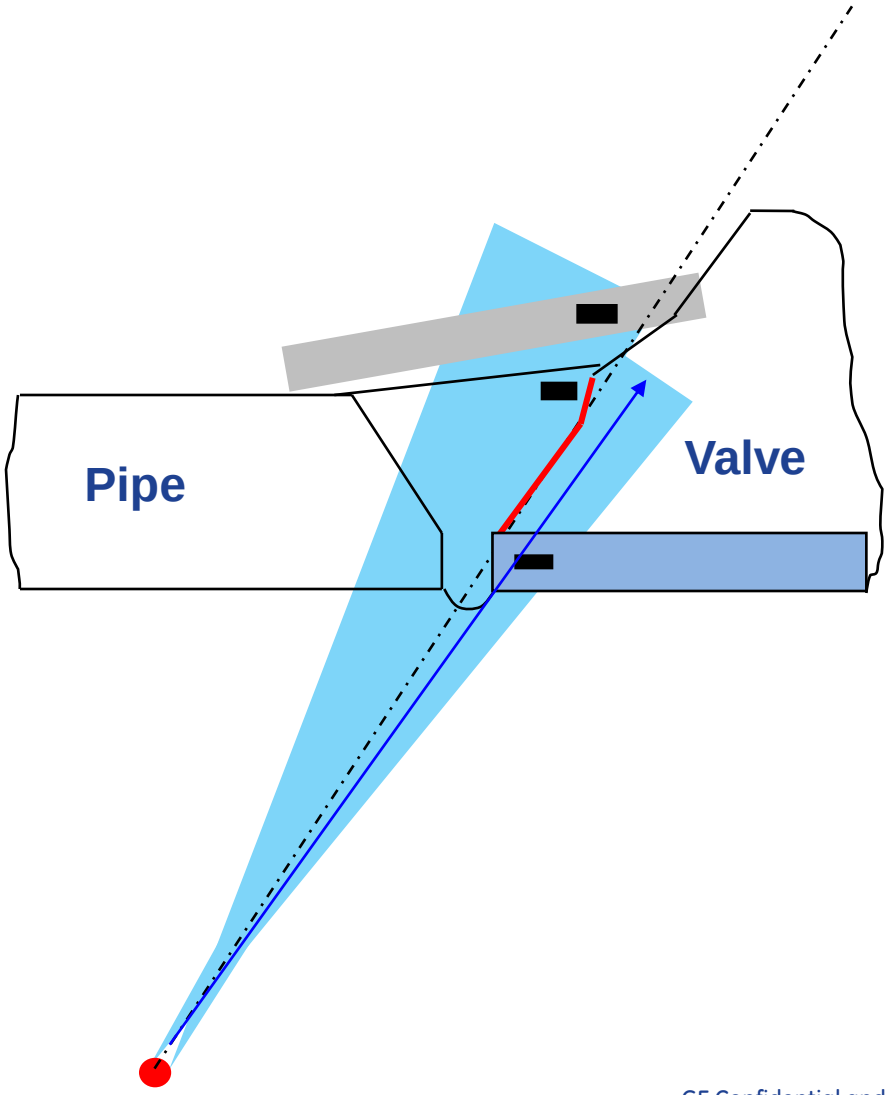


Normal Radiography

PETROLVALVE CLADDING ISSUE

Off-set Radiography



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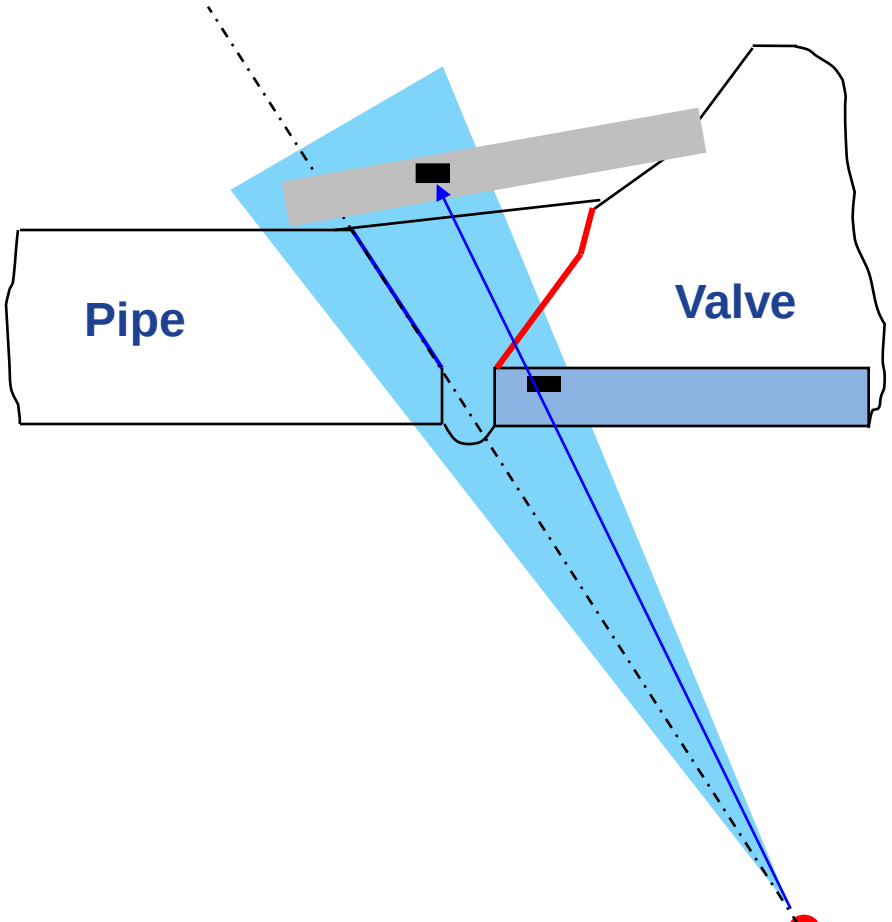
Off-set Radiography



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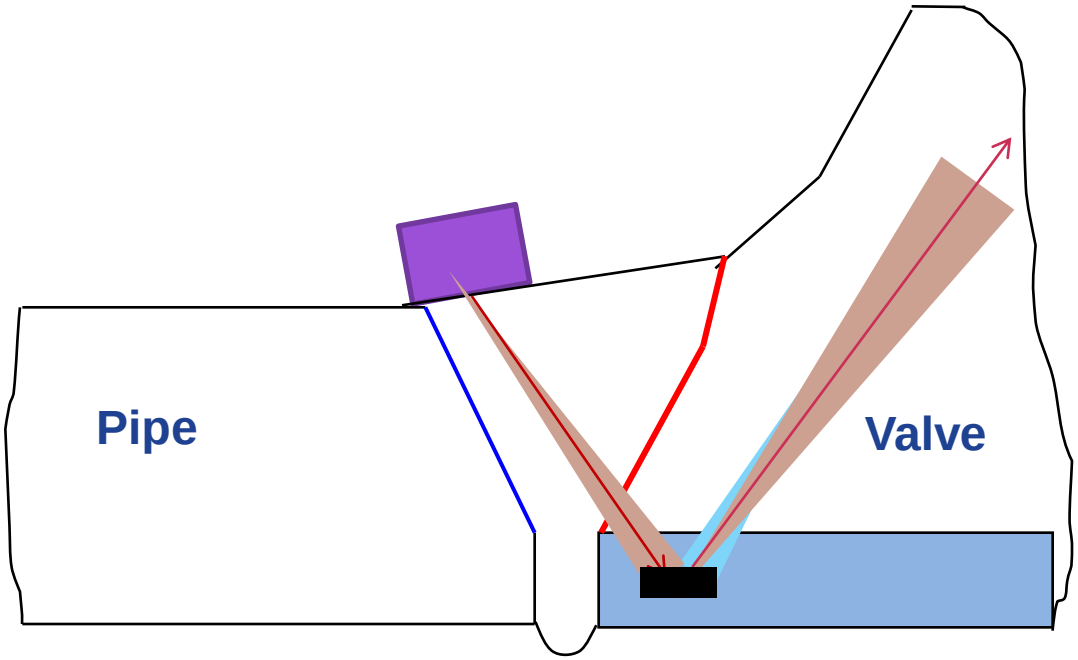
Ultrasonic Testing using angled compression wave



PETROLVALVE CLADDING ISSUE

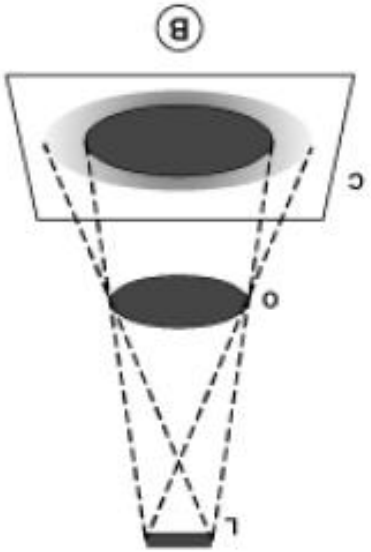
Radiographic Film Interpretation & Ultrasonic signal evaluation

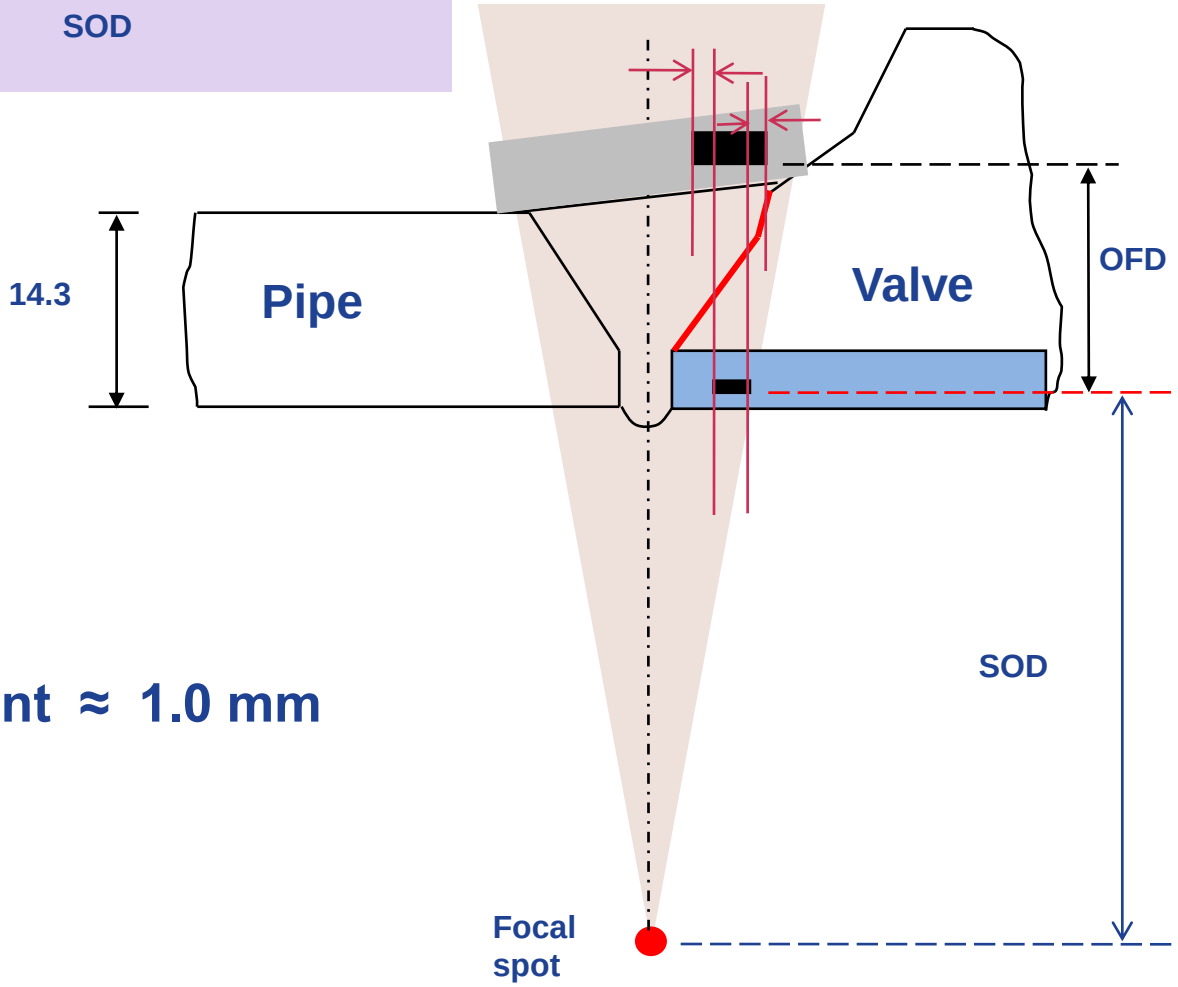
- **Cladding indications are appeared as projected image in the normal radiography**
- **Off-set radiography aiming for valve side fusion face, no indication noticed**
- **Off-set radiography aiming for pipe side fusion face, indication noticed**
- **Defects are not found by ultrasonic testing**

Conclusion from Radiographic Film Interpretation & Ultrasonic signal evaluation is that " indications are in cladding"

Geometric Unsharpness

$$Ug = \frac{EFSS \times OFD}{SOD} = 0.5\ mm$$





Net enlargement ≈ 1.0 mm

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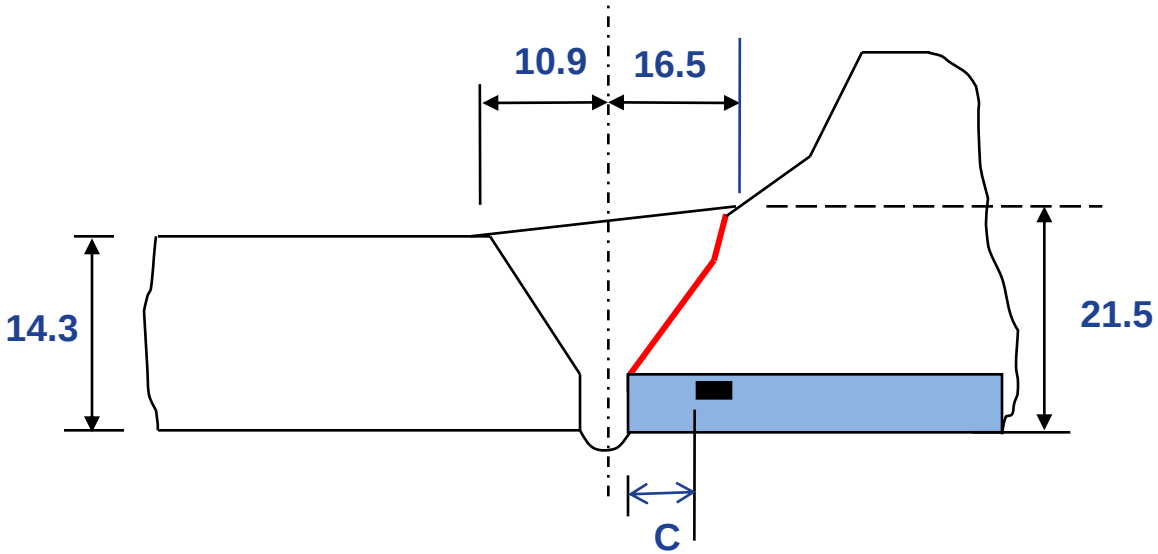
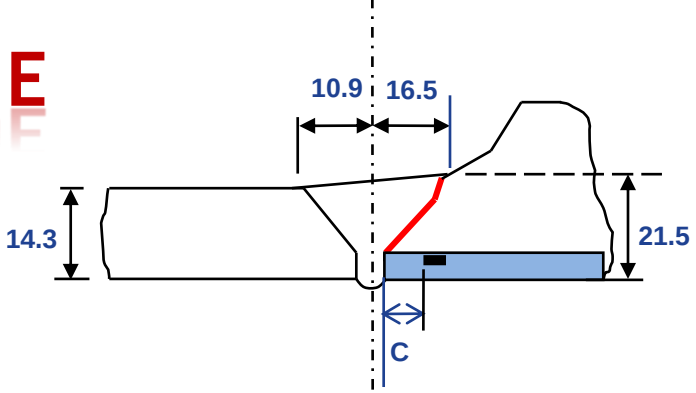
RT Indication Location



PETROLVALVE CLADDING ISSUE



RT Indication Location

Based on

20 welds

Weld No.	Bifab Drg No.	Size	Bifab Drg item no	Valve Serial No.	RT report No.	Distance from root toe (C)	
W3	BI 398-PI-TMT1-011	6"x14.3mm	14C	BO 555	R290	11 mm	
W6	BI 398-PI-TMT1-007	6"x14.3mm	18A	BO 612	R221	10 mm	
W15	BI 398-PI-TMT1-006	6"x14.3mm	18	BO 614	R284	6 mm	
W6	BI 398-PI-TMT1-006	6"x14.3mm	17B	BO 547	R308	10 mm	
W15	BI 398-PI-TMT1-004	6"x14.3mm	19	BO 548	R212	13 mm	
W16	BI 398-PI-TMT1-004	6"x14.3mm	19	BO 548	R213	16 mm	
W2	BI 398-PI-TMT1-009	6"x14.3mm	12B	BO 551	R313	14 mm	
W3	BI 398-PI-TMT1-009	6"x14.3mm	12B	BO 551	R314	11 mm	
W6	BI 398-PI-TMT1-009	6"x14.3mm	12A	BO 573	R315	14 mm	
W4	BI 398-PI-TMT1-011	6"x14.3mm	14C	BO 555	R291	13 mm	
W5	BI 398-PI-TMT1-009	6"x14.3mm	12A	BO 561	R349	13 mm	
W16	BI 398-PI-TMT1-011	6"x14.3mm	14B	BO 553	R322	12 mm	
W15	BI 398-PI-TMT1-007	6"x14.3mm	18	BO 609	R338	10 mm	
W16	BI 398-PI-TMT1-005	6"x14.3mm	18	BO 613	R330	13 mm	
W15	BI 398-PI-TMT1-011	6"x14.3mm	14B	BO 553	R337	11 mm	
W6	BI 398-PI-TMT1-011	6"x14.3mm	17B	BO 557	R369	1 mm	only in two location, 4 mm size
W15	BI 398-PI-TMT1-005	6"x14.3mm	18	BO 613	R329	11 mm	
W2	BI 398-PI-TMT1-006	6"x14.3mm	17A	BO 554	R331	12 mm	
W3	BI 398-PI-TMT1-006	6"x14.3mm	17A	BO 554	R332	14 mm	
W5	BI 398-PI-TMT1-007	6"x14.3mm	17B	BO 542	R326	10 mm	

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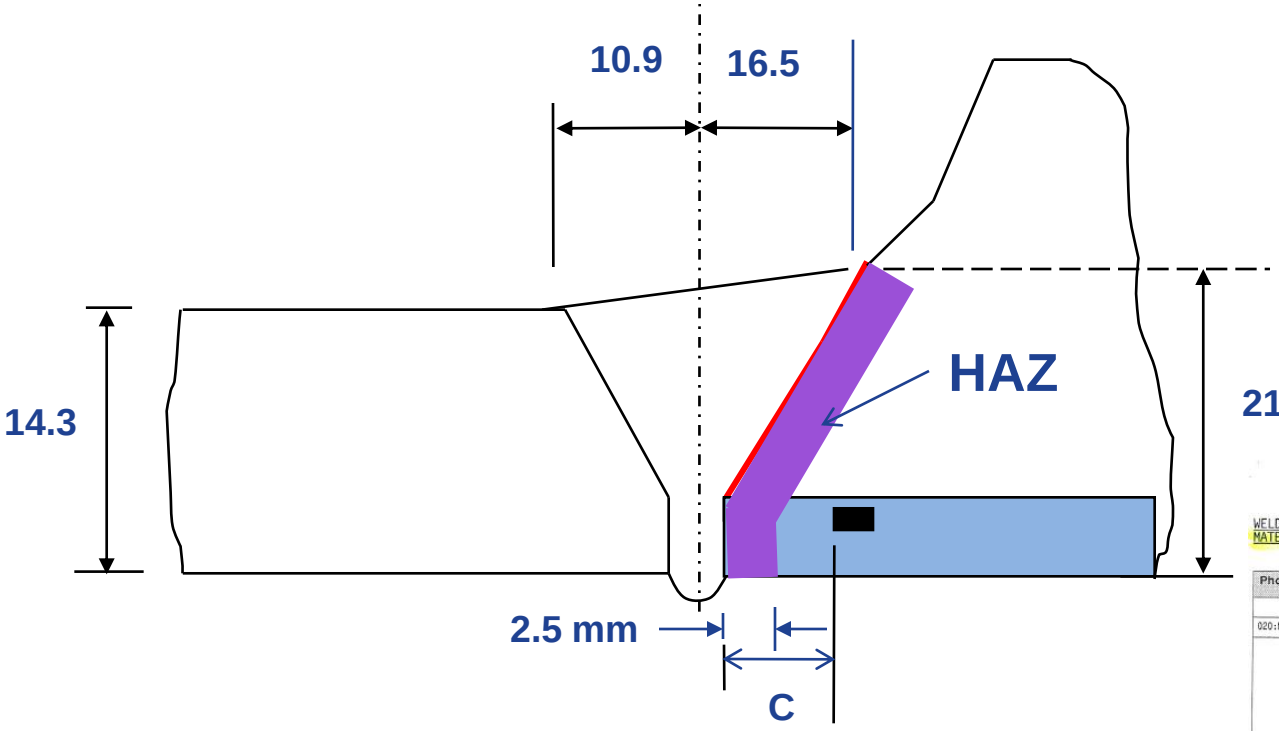
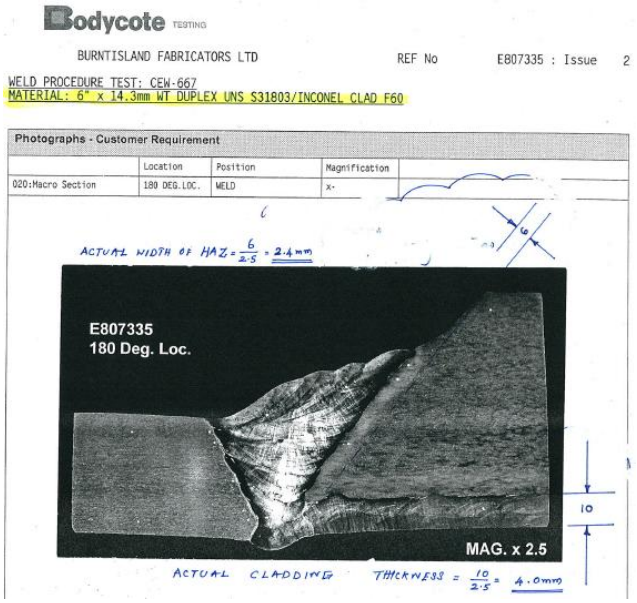
Indications are located away from the **HAZ**





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Macro Section

Bodycote TESTING

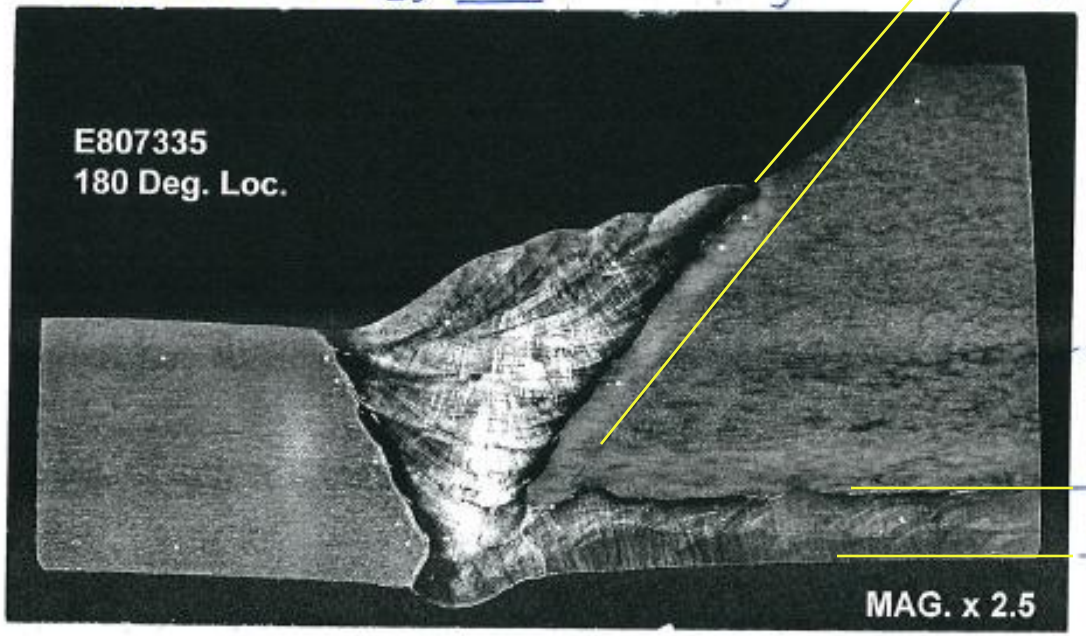
BURNTISLAND FABRICATORS LTD REF No E807335 : Issue 2

WELD PROCEDURE TEST: CEW-667
MATERIAL: 6" x 14.3mm WT DUPLEX UNS S31803/INCONEL CLAD F60

Photographs - Customer Requirement

	Location	Position	Magnification
020:Macro Section	180 DEG.LOC.	WELD	x-

ACTUAL WIDTH OF HAZ = $\frac{6}{2.5}$ = 2.4mm



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ACTUAL CLADDING THICKNESS = $\frac{10}{2.5}$ = 4.0mm

GE imag

Quality Control Requirement

Table 12 — Quality control requirements for welding

Weld type	Stages	PSL 1	PSL 2	PSL 3/PSL 3G	PSL 4
Pressure-containing	Preparation	—	—	a	No welding permitted
	Completion	—	a, b and (c or d)	a, b, (c or d), and e	
Non-pressure-containing	Preparation	—	—	a	No welding permitted
	Completion	—	a	a and e	
Repair	Preparation	—	h	h	No welding permitted
	Completion	—	a, b and (f or g)	a, b, e and (f or g)	
Weld metal overlay (ring grooves, stems, valve-bore sealing mechanisms and choke trim)	Preparation	—	—	b	b
	Completion	—	b	b	b
Weld metal corrosion-resistant alloy overlay (bodies, bonnets and end and outlet connections)	Preparation	a	a	a	a
	Completion	a, b	a, b	a, b, i	a, b, i

a Visual examination.

b Penetrant testing inspection for non-ferromagnetic materials and magnetic particle testing for ferromagnetic material.

c Radiation (radiography or imaging) examination.

d Ultrasonic examination.

e Hardness test (weld).

f Ultrasonic examination only if weld is greater than 25 % of wall thickness, or 25 mm (1 in), whichever is less.

g Radiation (radiography or imaging) examination only if weld is greater than 25 % of wall thickness for PSL 2, or 20 % of wall thickness for PSL 3, or 25 mm (1 in), whichever is less.

h Penetrant or magnetic particle as applicable for material defects only.

i Measurement of overlay thickness, testing of bond integrity and volumetric examination shall be according to the manufacturer's specifications. If the overlay is considered part of the manufacturer's design criteria or of the design criteria of this International Standard, volumetric examinations shall be in accordance with the methods and acceptance criteria of 7.4.2.3.15.

NOTE Preparation = Surface preparation, joint preparation, fit-up and preheat.
Completion = After all welding, post-weld heat treat and machining.

Summary

✓ **Majority of indications are away from " Single Vee Groove weld ", and confirmed that, it is in the cladding**

✓ **Enlargement of indication size due to Ug (Geometric Unsharpness) is upto 1 mm**

✓ **Location of the indications are away from the HAZ**

✓ **Indications are sub-surface. The same has been confirmed by visual and DPT .**

✓ **Minimum cladding thickness required is 3mm, but actual thickness available is approximately 4mm**

✓ **Cladding is not a part of design thickness**

cont…

Summary

✓ Petrolvalve has confirmed that cladding is not part of design thickness. Statement will be forwarded to BP

✓ VG will address cladding quality issue with Petrolvalve. VG will evaluate corrective measures in VG valve specification

✓ Corrective measures may imply

- Restricting cladding process to GTAW (eliminating GMAW) to improve weld overlay quality
- Increasing NDE by adding volumetric NDE for the weld end area
- Increase witness activity on welding/NDE at valve supplier
- Consider pup piece, although pup piece does not improve quality of cladding but cladding issues is addressed at valve manufacturer before arriving fabrication site

Conclusion

✓ **Based on the review of x-ray films and evaluations, the indication in the cladding will not affect the integrity of the valves. The valves are fit for purpose.**

✓ **Leave indication in the cladding as is.**

Thanks