

Comments to EB Welding Qualifications



P.Freijedo
Date: 30.01.2015



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WPQR's

- **NWV-WPQR-001 & NWV-WPQR-003:**

Could you explain us how you made *seal/dwell/weld*?

What is the meaning of *dwell* in this sequence?



NIOWAVE

Weld Procedure Qualification Record

Organization Name: Niowave Inc.
 Procedure Qualification Record Number: NWV-WPQR-001
 WPS No: NWV-WPS-001
 Welding Processes: E Beam Weld
 Types (Manual, Automatic, Semi-Automatic): Automatic

Joins (QW-402):

Groove Design of Test Coupon

Base Metals (QW-403)		Post Weld Heat Treatment (QW-407)	
Material Spec.	<u>Niobium</u>	Temp	_____
Type/Grade	<u>RRR 300</u>	Time	_____
P-No.	<u>N/A</u> to P-No. <u>N/A</u>	Other	<u>Vacuum cooldown 20 minutes</u>
Group No.	<u>N/A</u> Group No. <u>N/A</u>		<u>Nitrogen cooldown 20 minutes</u>
Thickness of Test Coupon	<u>3 mm (0.118")</u>		<u>Chamber opened ≤ 115°F</u>
Maximum Pass Thickness	<u>3 mm (0.118")</u>		
Other	_____		
		Gas (QW-408)	
		Percent Composition	
		Gas	Mixture Flow
		Shielding	_____
		Trailing	_____
		Backing	_____
		Other	<u>Vacuum Level <37 μTorr</u>
		Electrical Characteristics (QW-409)	
		Current	<u>30/59/56 μA seal/dwell/weld</u>
		Polarity	_____
		Amps.	Volts. <u>50 kV</u>

Filler Metals	1	2
SFA Specification	_____	_____
AWS Classification	_____	_____
Filler Metal F-No.	_____	_____
Weld Metal Analysis A-No	_____	_____
Size of Filler Metal	_____	_____
Filler Metal Product Form	_____	_____
Supplemental Filler Metal	_____	_____



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NWV-WPQR-005: Indicate the material Nb55Ti

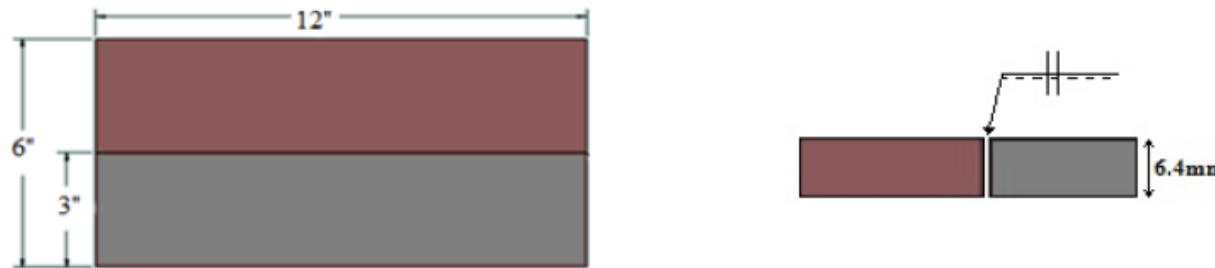
Niowave Proprietary



Weld Procedure Qualification Record

Organization Name: Niowave Inc.
 Procedure Qualification Record Number: NWV-WPQR-005
 WPS No: NWV-WPS-002
 Welding Processes: E Beam Weld
 Types (Manual, Automatic, Semi-Automatic): Automatic

Joints (QW-402):

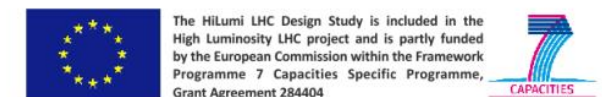


Groove Design of Test Coupon

Base Metals (QW-403)		Post Weld Heat Treatment (QW-407)	
Material Spec.	<u>Niobium / Niobium55Titanium</u>	Temp	_____
Type/Grade	<u>RRR 300</u>	Time	_____
P-No.	<u>N/A</u> to P-No. <u>N/A</u>	Other	<u>Vacuum cooldown 20 minutes</u>
Group No	<u>N/A</u> Group No. <u>N/A</u>		<u>Nitrogen cooldown 20 minutes</u>
Thickness of Test Coupon	<u>6.4 mm (0.250")</u>		<u>Chamber opened ≤ 115°F</u>
Maximum Pass Thickness	<u>3.84 mm (0.150") 60% Thickness</u>		
Other	_____		
		Gas (QW-408)	
		Percent Composition	
		Gas	Mixture Flow
		Shielding	_____
		Trailing	_____
		Backing	_____
		Other	<u>Vacuum Level <37 μTorr</u>
Filler Metals			
	1	2	
SFA Specification	_____	_____	
AWS Classification	_____	_____	
Filler Metal F-No.	_____	_____	



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Visual & Radiographic test

The Visual and radiographic test have been performed on EB welding samples provided by Niowave:

- NWV-EBW-001
- NWV-EBW-002
- NWV-EBW-003
- NWV-EBW-004
- NWV-EBW-005



Radiographic defects were not found, but we have seen defects such as: Undercut, excessive penetration, incompletely filled groove, linear misalignment... They do not look compliant with the CERN requirements of the Engineering Specification (table 6).

Metallographic tests to be performed next week.



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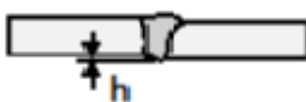
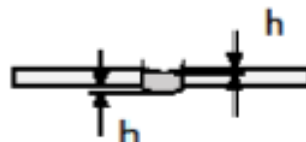






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Requirements for NbNb welds: Engineering Specification-Table 6

Table 6: Acceptance levels of niobium welded joints imperfections

EN ISO 6520-1 reference	Imperfection designation	Remarks	Limits for imperfections
5011 5012	Undercut		h max 0.1 mm
504	Excessive penetration		h max 0.1 mm
507	Linear misalignment		h max 0.1 mm
509	Sagging		h max 0.2 mm
511	Incompletely filled groove		h max 0.2 mm
515	Root concavity		h max 0.1 mm
5013	Shrinkage groove		Not acceptable
602	Weld spatter		Not acceptable



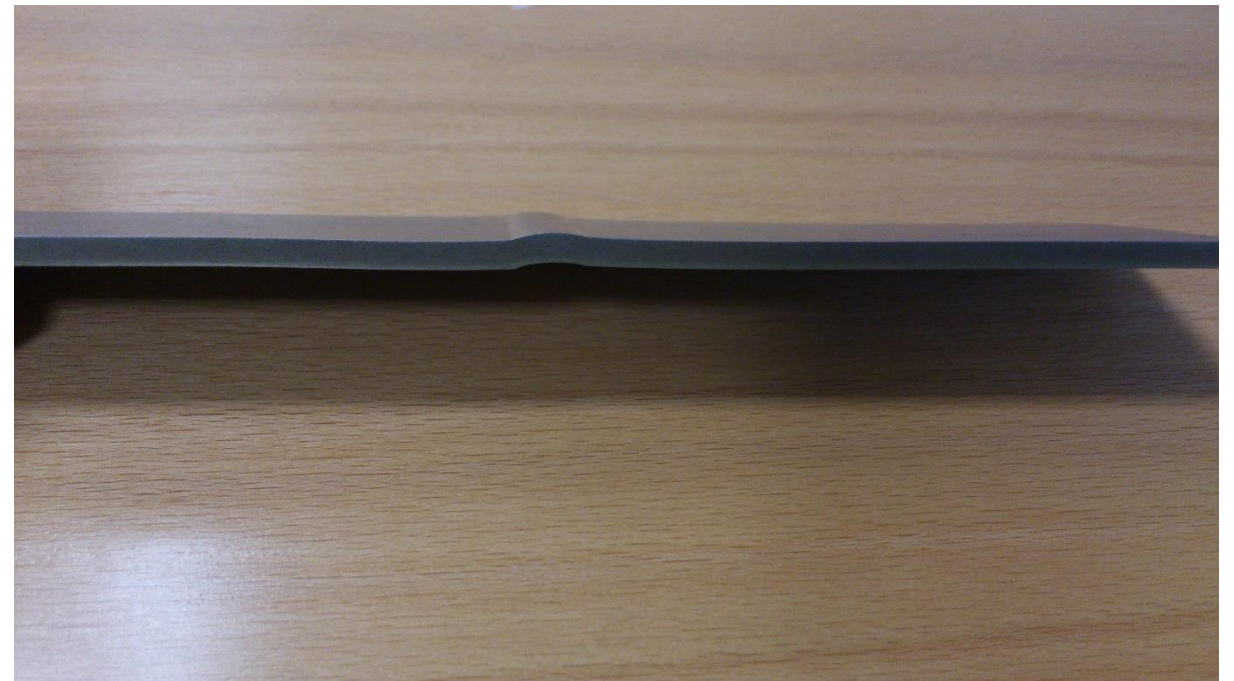
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Pictures



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