

## Metals Industry Conference 2015

### Business Excellence – AS/NZS ISO 3834 Certification for Welded Fabrication

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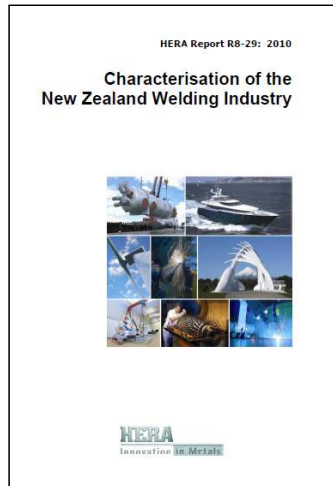


## The scope of this presentation

1. NZ welding industry – some facts
2. NZ welding standards
3. ISO 3834
4. Steel Fabricator Certification (SFC)
5. The welding cost factor
6. Summary



## NZ Welding Industry – some facts



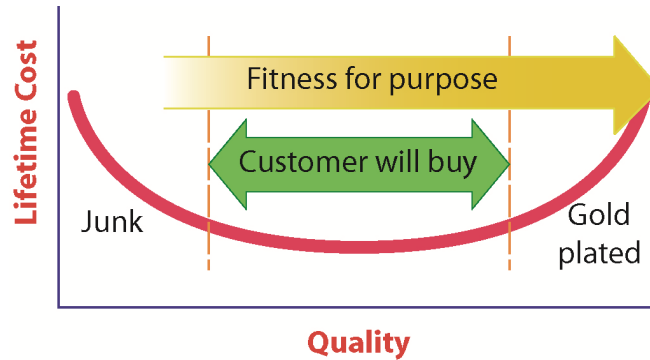
- The value added of joining technology is estimated an average of NZ\$813 million in 2007
- Fabricated welded export products have a share of NZ\$480 Million in 2000 and NZ\$660 Million (2008)
- An estimate of 6500 people work as fulltime and casual welders, and a further 800 people as welding related personnel

## AS/NZS Welding and related standards

- **AS/NZS 1554** Welding of steel structures
  - Part 1: Welding of steel structures
  - Part 2: Stud welding (steel studs to steel)
  - Part 3: Welding of reinforcing steel
  - Part 4: Welding of high strength quenched and tempered steels
  - Part 5: Welding of steel structures subject to high levels of fatigue loading
  - Part 6: Welding stainless steels for structural purposes
  - Part 7: Welding of cold formed steel structures
- **AS/NZS 1665:2004** Welding of aluminum structures
- **AS/NZS 3992** Pressure equipment—Welding and brazing qualification
- **AS/NZS 2980** Qualification of welders for fusion welding of steel
- **AS/NZS 3834 Part 1 to 5** Quality requirements for fusion welding of metallic materials
- **NZS3404.1:1997:** Steel Structures
- **NZS 3404.1:2009** Steel structures Standard – Part 1: Materials, fabrication, and construction
- **AS/NZS 1200** Pressure Equipment

## The purpose of welding standard

Standards aim to produce welded steel structures which are **safe and reliable** for the intended application and are **economical** to fabricate.



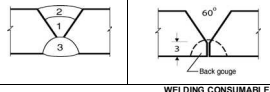
## Basic Welding Requirements of AS/NZS 1554

### A weld shall:

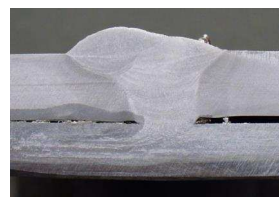
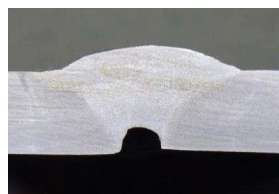
- Be deposited following qualified WPS
  - Be deposited by qualified welder
  - Be deposited under adequate supervision
- .... and comply with all appropriate requirements of the Standard

## Procedure Qualification Record (PQR)

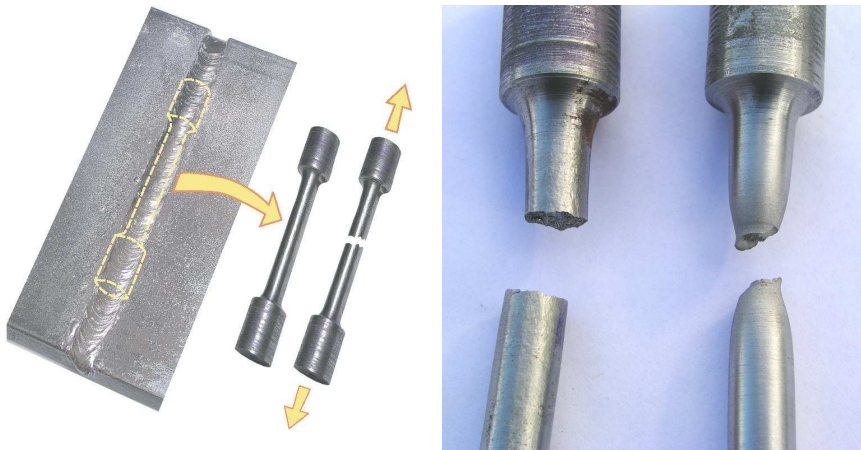
## Welding Procedure Specification (WPS)

PROCEDURE QUALIFICATION RECORD (PQR)									
Material specification		AS/NZS 3678 300		To		AS/NZS 3678 300		PQR	
Fabricator		Wizzard Fabrikashone Ltd.		TE 506		Date qualified		1/4/2012	
Standard		AS/NZS 1554.1 2011		Welded by		Wally Elder		Page	
Process		FCAW Gas shielded		Revision		1 of 2		Date	
Edge preparation		Bevel		Revision		0		Date	
Weldability group no.		4		Specimen thickness		12mm		Flat 1G	
Preheat temperature		na		PWHT		na		Hold	
Inter-run temperature		230°C max.		Other		na		na	
Type and check method		Digital thermometer		Joint details		na		na	
									
<p>Prequal Joint No. B-C 2d To table E1 Root gap 3 Root face 3 Included angle 60° Backing na</p>									
WELDING CONSUMABLES									
Specification		AS/NZS ISO 17832B		Flow rate		17 l/min		Flux na	
Classification		T 49 2 T1-1 C A-UH10		Shielding gas		CO2		Purge gas	
Side		1G		Position		1.2		Vericore	
Run No.		1, 2		Amperage		282		31	
Voltage		31		Current		DCEP		320	
Speed		315		Heat input		1.6		na	
WELD RUN DETAILS									
Run No.		1, 2		Side		1G		Position	
Backgouge to sound metal		na		Technique		Stringer weave		Initial cleaning	
Grinding		na		Electrical stickout		18mm		Backgouge method	
Chip, wire brush		na		Air carbon arc		na		Nozzle size	
20mm		na		Test Results		Tensile		Bend	
Charpy V		Hardness		Other		na		na	
Test by		Visual		Macro		WTL		XY234	
Result		Complies		Complies		na		na	
Notes/revisions		na		na		na		na	
Witnessed by		D. Supaviza		Approved by		na		na	
Wizzard Fabrikashone Ltd.		1/4/2012		na		na		na	

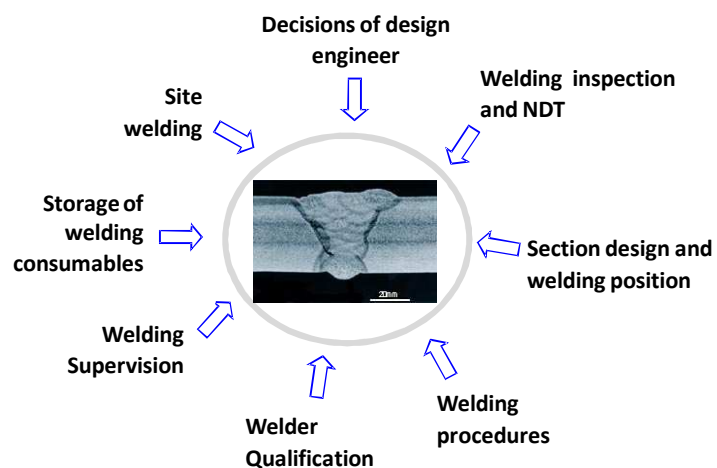
WELDING PROCEDURE SPECIFICATION (WPS)									
Material specification		AS/NZS 3678 HA300		To		AS/NZS 3678 HA300		WPS No.	
Fabricator		Wizzard Fabrikashone Ltd.		TE 506		Date		1/4/2012	
Standard		AS/NZS 1554.1 2011		PQR No.		TE 506		Page	
Process		FCAW Gas shielded		Revision		0		Date	
Edge preparation		Bevel		Positions		Flat 1G		PWHT	
Welding direction		na		Hold		na		Other	
Range qualified		Thickness range: 6 - 24mm		Inter-run temperature (max.)		na		na	
Preheat temperature		na		Joint sketch		Run sequence		Joint tolerance	
Method and check method		na		Pre-qualified Joint No.		B-C 2d		E1	
Inter-run temperature (max.)		na		To Table		na		na	
na		na		Root gap G mm		na		na	
na		na		Root face Fr mm		na		na	
na		na		Ind angle θ°		na		na	
na		na		Backing		na		na	
Welding consumables									
Specification		AS/NZS ISO 17832B		Flow rate		16 - 20 l/min		Flux na	
Classification		T 49 2 T1-1 C A-UH10		Shielding gas		CO2		Purge gas	
Side		1G		Position		1.2		Vericore	
Run No.		1, 2		Amperage		282		31	
Voltage		31		Current		DCEP		320	
Speed		315		Heat input		1.6		na	
Weld run details									
Run No.		1, 2		Side		1G		Position	
Backgouge to sound metal		na		Technique		Stringer weave		Initial cleaning	
Grinding		na		Electrical stickout		15-21mm		Backgouge method	
Chip, wire brush		na		Air carbon arc		na		Nozzle size	
20mm		na		Test Results		Tensile		Bend	
Charpy V		Hardness		Other		na		na	
Test by		Visual		Macro		WTL		XY234	
Result		Complies		Complies		na		na	
Notes/revisions		na		na		na		na	
Witnessed by		D. Supaviza		Approved by		na		na	
Wizzard Fabrikashone Ltd.		1/4/2012		na		na		na	



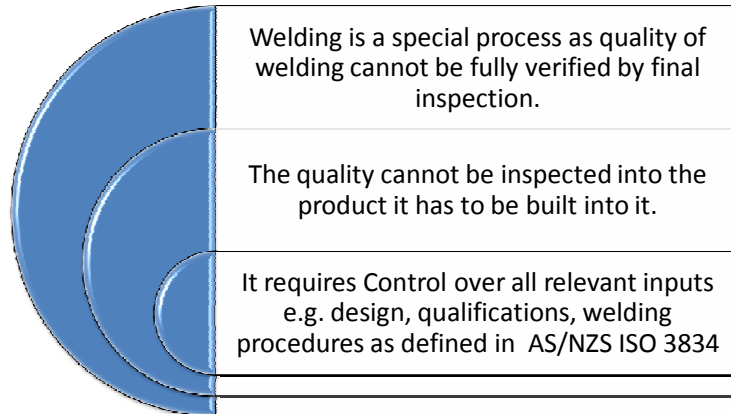
Weld metal properties – not all welding wires are created equal!



## Some factors Influencing fitness-for-service of welded joints



## Quality Management in Welding Fabrication - Basics



## The “quality has to be built into the product” philosophy



- Originated within German standards in 1930s that required fabricator to appoint a competent welding engineer (Responsible Welding Coordinator RWC in ISO 3834 )
- RWC is the person who is competent to control and supervise welding activities.
- RWC shall technical knowledge and experience appropriate for the range of fabricated products.

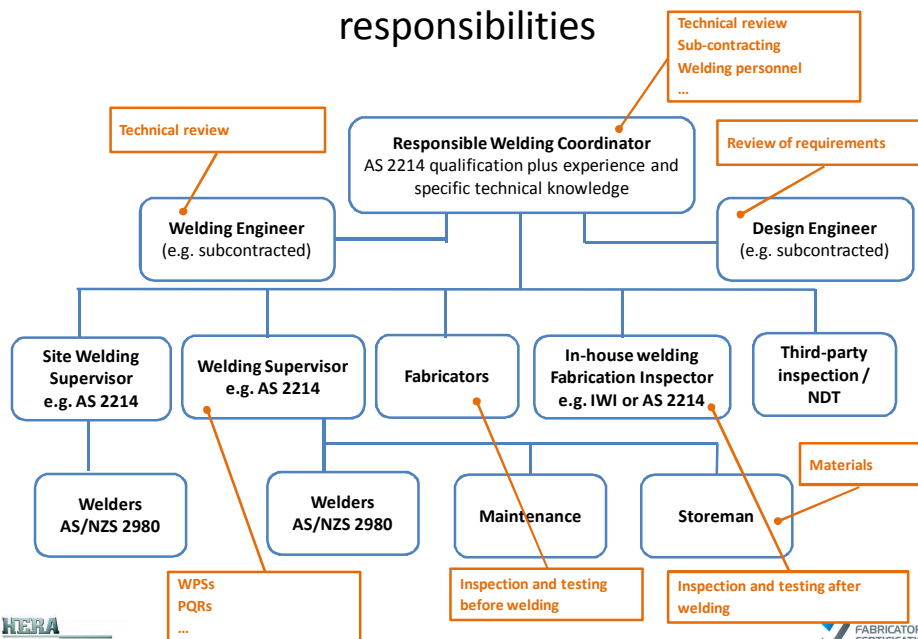
## ISO 14731 Welding coordination — Tasks and responsibilities (*continues*)

Welding coordinators shall demonstrate:

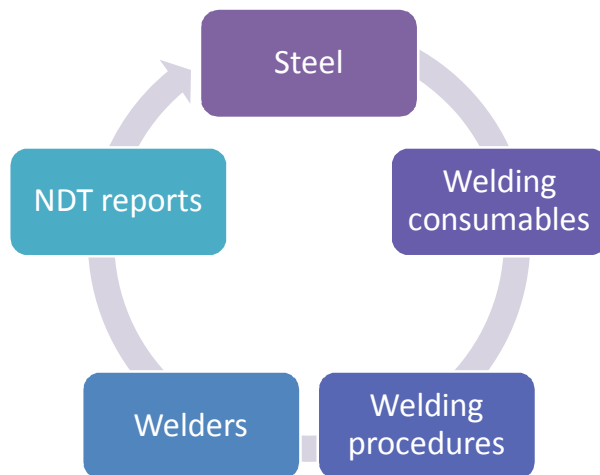
- general technical knowledge;
- specialized technical knowledge in welding and allied processes relevant to the assigned tasks, which shall be attained by a combination of theoretical knowledge, training and/or experience.

The extent of required experience shall depend on the assigned tasks and responsibilities.

### Example welding coordination team – tasks and responsibilities



## Full traceability requirements of SFC CC3



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FABRICATOR  
CERTIFICATION  
SFC CC3

## Materials traceability



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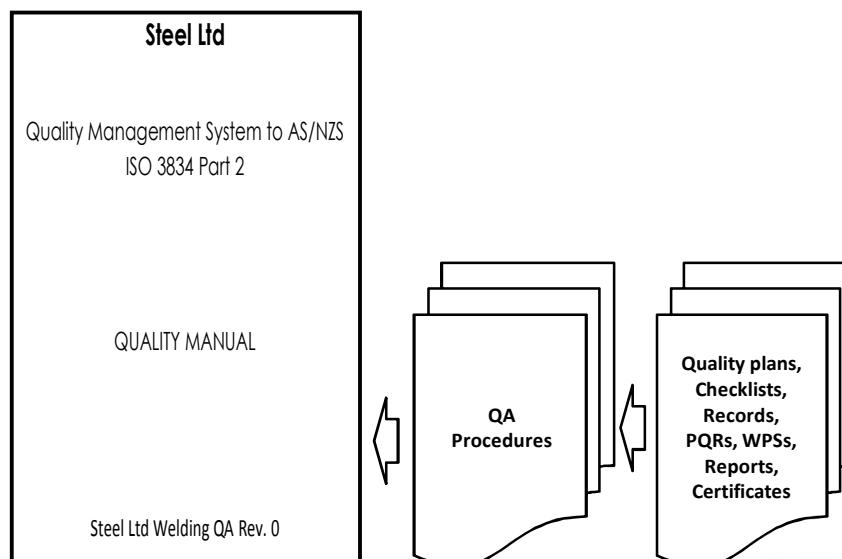


## Weld – Welder- WPS – Test report traceability example

Date: 15/06/2015

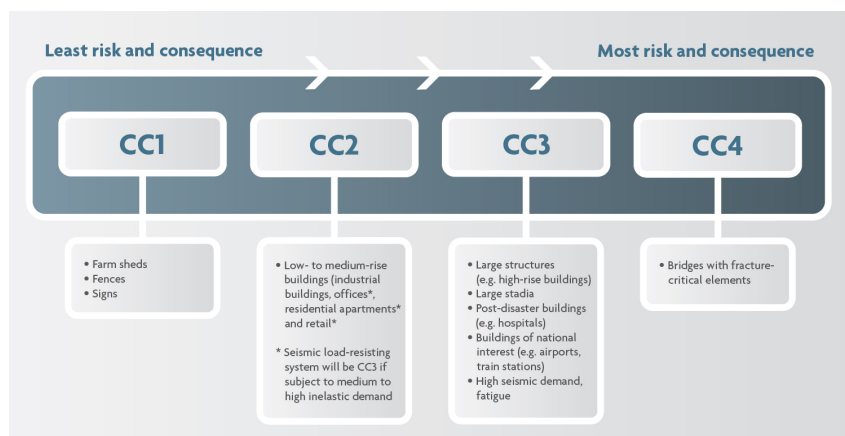
Drawing No.	Description	WPS No.	Weld No.	Welder ID	Weld Type	Test Standard	RT	UT	MT	PT	C/DNG	Report No.
136	Base Plate	65	54	JF	FW	1554.1			1		C	15-008395-05
A-121	Beam to beam Flange welds	9	55	JH	BW	1554.1		1			C	15-008395-07
A-121	Base Plate and Cleat	65	56	JH	FW	1554.1			1		C	15-008395-05
138	Base Plate	65	57	U4	FW	1554.1			1		C	15-008395-05
138	Splice Plates	65	58	U4	FW	1554.1			1		C	15-008395-05
A-119	Beam to beam Flange welds	9	59	JD	BW	1554.1		1			C	15-008395-07
A-119	Base Plate	65	60	MG	FW	1554.1			1		C	15-008395-05
A-124	Beam to beam Flange welds	9	61	JD	BW	1554.1		1			C	15-008395-07
A-124	Base Plate	65	62	JD	FW	1554.1			1		C	15-008395-05
A-124	Gusset and Cleat	65	63	JD	FW	1554.1			1		C	15-008395-05
A-123	Beam to beam Flange welds	9	64	JMP	BW	1554.1		1			C	15-008395-07
A-123	Base Plates	65	65	JMP	FW	1554.1			1		C	15-008395-05
A-123	Gusset and Cleats	65	66	JMP	FW	1554.1			1		C	15-008395-05
A128	Base Plate and Cleat	65	67	RP	FW	1554.1			1		C	15-008395-05
A-128	Gusset and Cleats	65	68	RP	FW	1554.1			1		C	15-008395-05
201X	Base Plate	65	69	DA	FW	1554.1			1		C	15-008395-05
201X	Plate and end cap	65	70	DA	FW	1554.1			1		C	15-008395-05
A-120	Beam to beam Flange welds	9	71	ALW	BW	1554.1		1			C	15-008395-07

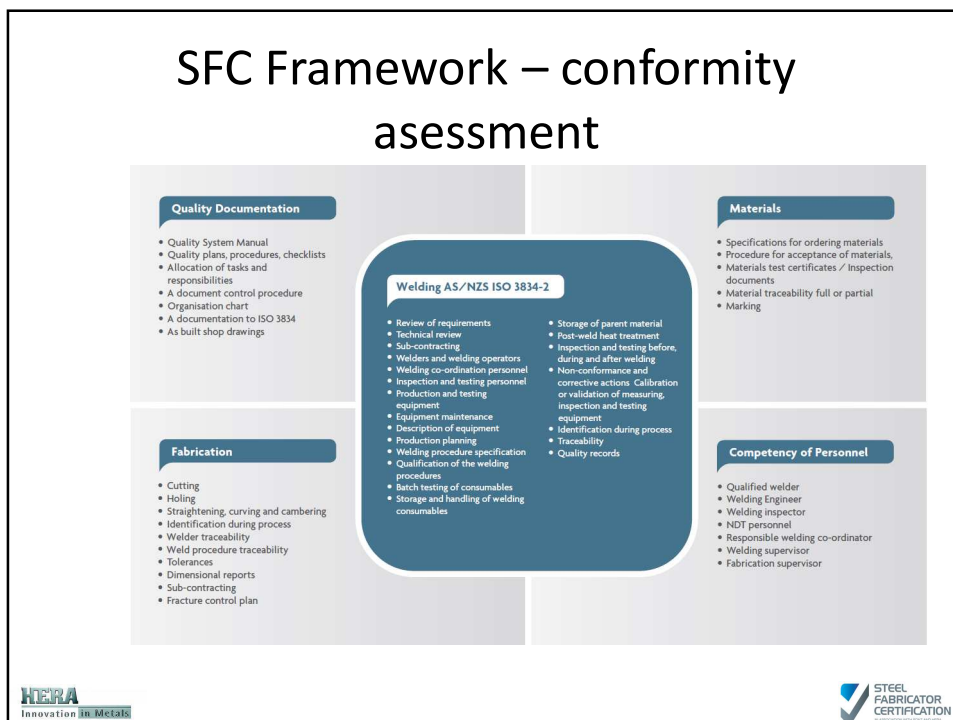
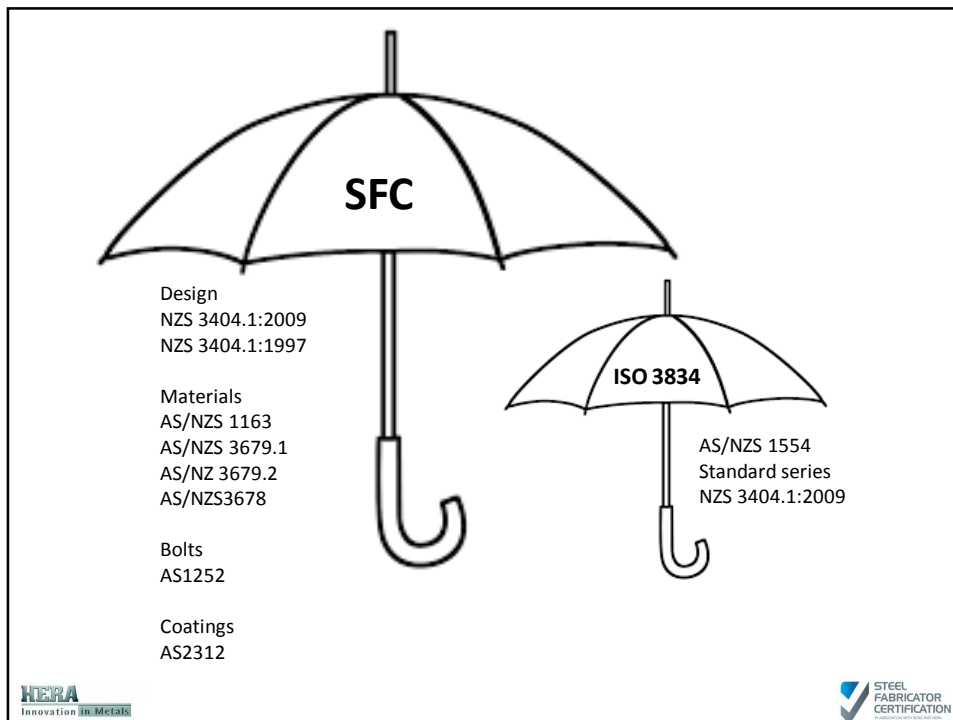
## QA Documentation



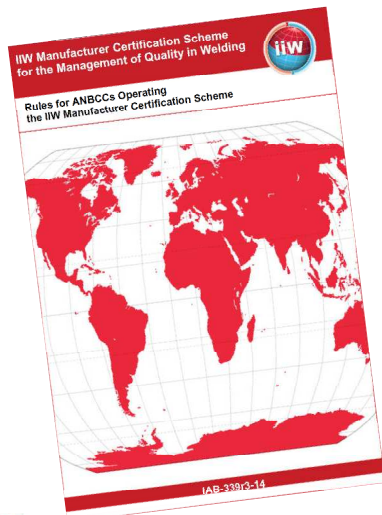


## SFC construction categories





## Verification of compliance – Welding and related activities



HERA ANBCC audit is to the requirements of the International Institute of Welding Manufacturer Certification Scheme to ISO 3834 Part 2 or 3

## How does the Scheme work?

- Project engineers specifies construction categories (CC) for the steel structure.
- Certification to the specified CC or higher is required for fabricators to perform the work.
- The Scheme has started as a voluntary one. It will eventually becoming a part of regulatory requirements.

## Certified Companies 2014



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**STEEL FABRICATOR CERTIFICATION**  
AN ISO 9001 CERTIFICATION

## Certified Companies 2015



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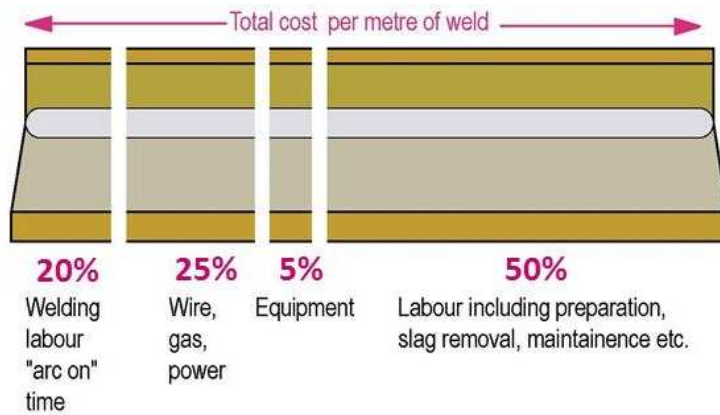
**STEEL FABRICATOR CERTIFICATION**  
AN ISO 9001 CERTIFICATION



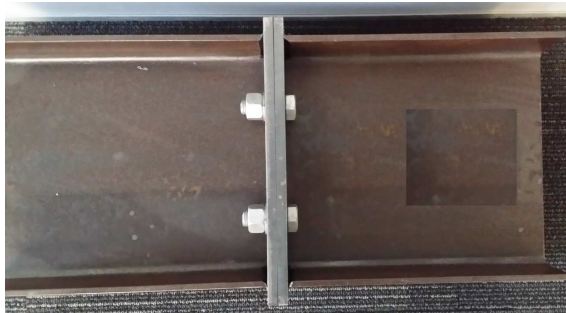
## The fabrication cost factor



## MIG/MAG Typical Welding Costs for Carbon Steel



## Repair welding cost



Fitting and welding:	4 hours x 75 \$/h = \$300	\$450 Production weld cost
NDT:	\$150	
Handling/gouging:	3 hours x 75 \$/h = \$225	\$975 Re-work cost
Re-welding:	3 hours x 75 \$/h = \$225	
Loss of production:	5 hours x 75 \$/h = \$375	
NDT after repair:	\$150	
<b>Total:</b>	<b>\$1425</b>	



## Some Findings of AWS Study at US shipyards

Possible annual savings of approximately \$17,044 per welder:

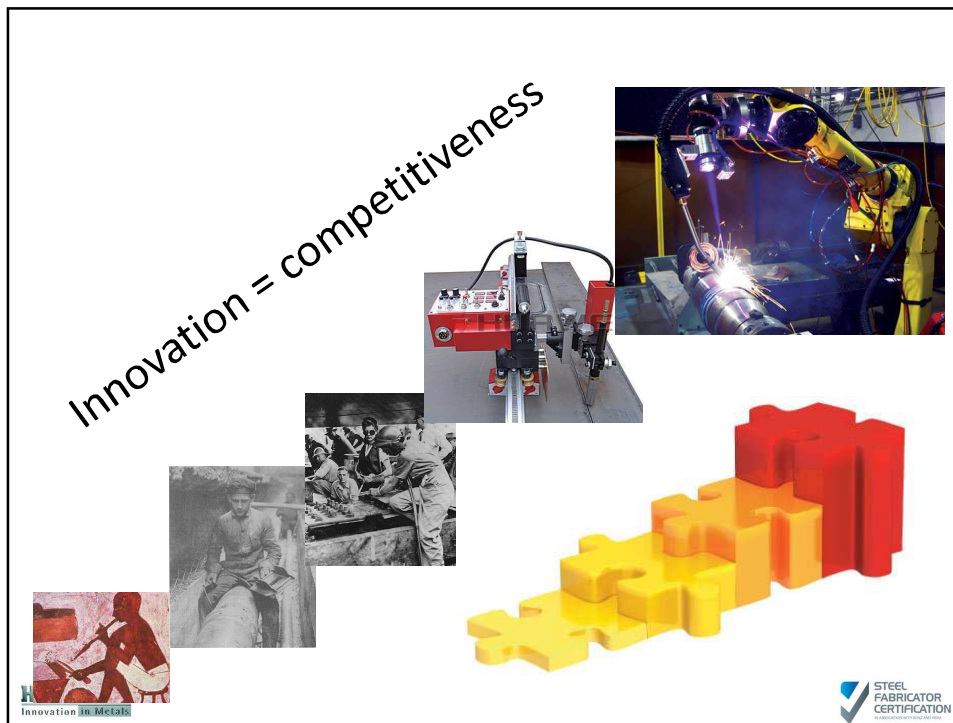
- \$3,319 through the reduction of weld metal volume.
- \$4,281 through the reduction of arc time.
- \$3,244 through the reduction of rework, scrap and rejects.
- \$6,200 through the reduction of work effort, motion and delay time.

The study concludes that the appropriately qualified welding supervisor is the key to achieve these savings.

## Welding quality management tools







## Summary

- Quality of welding cannot be fully verified by final inspection. It requires special process control to ISO 3834.2.
- ISO 3834.2 is the key certification plank of the of the Steel Fabricator Certification (SFC) scheme.
- The fabricator is required to employ qualified staff and to implement procedures to ensure control over welding/fabrication process.
- The correct implementation of the system leads to the reduction in rework and productivity gains.

## For more information

- SFC Code of Practice
- SFC website:  
[www.steelfabcert.co.nz](http://www.steelfabcert.co.nz)

The screenshot shows the Steel Fabricator Certification (SFC) website. At the top is the SFC logo and a navigation menu with links: ABOUT, BENEFITS, FRAMEWORK, BECOME CERTIFIED, SFC FABRICATORS, and CONTACT. Below the navigation is a large blue banner with the text "Independent, expert certification of steel fabricator capability". Under the banner, a paragraph states: "The Steel Fabricator Certification (SFC) scheme ensures certified New Zealand fabricators manufacture structural steelwork according to international best practice." Below this is a section with three circular images and text blocks:

- Become Certified**: SFC certified fabricators must demonstrate to an independent auditing body that they have the appropriate quality management systems in place to control the critical fabrication processes. Your SFC journey starts with contacting HERRA Certification Ltd. [Read more...](#)
- Certified fabricators**: Certified fabricators will display an SFC quality mark so procurers and specifiers can readily identify companies that meet the required SFC standards. Click here for a list of fabricators that have achieved SFC status. [Read more...](#)
- Four Pillars of SFC**: The SFC scheme is based on four pillars: technical requirements, a risk-based approach, conformity assessment and an independent auditing body. [Read more...](#)