

RR1215 (2014) – Energy Division Regulatory Perspective on Welding Management

**Walt Doxford HM Specialist Inspector
Materials and Corrosion Offshore Energy Division**



Case Study 1 (Of Many)

**TODAYS QUALITY IS TOMMOROWS
MAJOR ACCIDENT HAZZARD**

What Is welding

Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure or a combination of both forming a join as the parts cool.

Welding is a Special Process

A special process refers to a manufacturing or production process where the output cannot be fully verified by inspection or testing alone, meaning the quality of the product depends significantly on the process itself and the skill of the operator. Instead, the process must be closely monitored and controlled to ensure consistent results.

Key Aspects of Special Processes in ISO 9000: (A family of Quality Management Standards)

1. Verification Challenges:

- **Special processes produce outputs that cannot be fully inspected or tested without destroying the product.**
- **Example: A weld's internal integrity or a heat-treated material's structural properties,**

2. Process Validation:

- **To manage special processes, ISO 9001 (the standard for quality management systems within ISO 9000) requires process validation.**
- **This involves:**
 - **Defining the process requirements.**
 - **Monitoring and controlling key parameters (e.g., temperature, pressure, and time).**
 - **Documenting the methods and results.**
- **Validation ensures the process consistently produces outputs meeting specified requirements.**

3. Requirements for Special Processes (ISO 9001:2015 Clause 8.5.1):

- **Properly qualified personnel and operators.**
- **Use of approved equipment and procedures.**
- **Continuous monitoring and recording of process conditions.**
- **Periodic revalidation to maintain confidence in process effectiveness.**

By addressing special processes, ISO 9000 standards emphasize the importance of preventing defects through process control rather than relying solely on post-production testing.

IN THE CASE OF WELDING Non-Destructive Testing
only confirms the presence of defects or not.

Case Study 1 (Of Many)

A complaint was received by the HSE from a UK Citizen employed in the Netherlands by a pressure vessel manufacturer. Note while the manufacturing – fabrication took place out with the HSE’s jurisdiction, the vessels were purchased by a duty holder operating in the UKCS. And were eventually installed on a UK offshore asset.

Alleged Manufacturing and Fabrication issues

- 1) Manufacturing: Lack of control during Manufacture.
 - a. Distortion during welding resulting in ovality issues
 - b. Dimensional control ill-fitting tube bundle possible cause of vibration.
 - c. Repair to Tube bundles and partition plates carried out after “Hydrotesting” this included hammering and forcing components back into alignment. grooves and gouges were covered over by welding and filed down to obscure detection by inspection department.
 - d. Inadequate application of the arc air gouging process “failure to remove carbon impregnated material” in repair areas prior to welding.

Case Study 1 (Of Many)

2) Welder Qualification and Welding Procedure Qualification.

- a.The use unqualified or inappropriately qualified agency personnel to carry out welding operations on pressure containing components.**
- b.Falsification of welder qualification test certification.**
- c.Quality of end plate welds compromised due to welding personnel lack of experience.**
- d.Numerous attempts at repairing defective welds; out with accepted international national and industry guidelines.**
- e.Welding procedures not followed at the instruction of Forman**
- f.Use of incorrect filler wire on welds.**
- g.Failure to use weld backing gas when required.**

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Case Study 1 (Of Many)

3) NDT:

- a.Failure to work to quality plan dye penetrant inspection on root welds not completed when completed the top of the root run was inspected not the weld root.**
- b.Re numbering of welds so that welds of known good quality were radiographed to miss lead on the quality of the fabrication.**
- c.Failure to carry out suitable NDT on areas of welding repair.**

Case Study 1 (Of Many)

4. Quality Control

- a. Carrying out Hydrotesting after application of Coatings**
- b. Employee obscuring leak from “Third Party” Inspector during hydrotesting**

Case Study 1 (Of Many)

5) Supervision and Culture:

- a. Personnel reprimanded for telling a “Third Party” inspector the truth regarding welding processes used during fabrication.**
- b. Allegations that the sales engineer reported minimum truth during testing and subsequent replacement of tube bundles.**

Case Study 1 (Of Many)

Senior Management Involvement and Awareness:

The company's senior management allegedly aware of the issues and have promised the complainants Lawyer that they would investigate the issues with the full involvement of a “Third Party” Certification Company”.

Outcome for the Fabrication Company:

- **The complainant no longer employed by the company**
- **Some of the issues have been corroborated by another employee**
- **The complaint went through the Courts in the Netherlands and the case was upheld.**
- **The site concerned has ceased production (Closed down) Other sites are still operating?**

Case Study 1 (Of Many)

CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

has been approved by Lloyd's Register Quality Assurance to the following Quality Management System Standard:

ISO 9001 : 2008

The Quality Management System is applicable to:

Engineering, Manufacturing and Servicing of Industrial Shell & Tube Heat Exchangers, Air-cooled Coolers and Pressure Vessels, including associated welding controls in accordance with the requirements of ISO 3834-2:2005.

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

Approval Certificate No:	Original Approval	:	27 October 2011
	Current Certificate	:	27 October 2014
	Certificate Expiry	:	26 October 2017

CERTIFICATE SCHEDULE

ISO 3834-2 Scope of Activity

Type of products	Industrial shell & Tube Exchangers, Air-cooled Coolers, Pressure Vessels and Sub-contracted welding activities.
Product standards	ASME, RToD, AD2000, PD5500, EN 13445 and customer specifications.
Parent materials groups (ISO/TR 15608)	Welding and allied processes (ISO 4063)
1, 2, 3, 4, 5, 8, 9, 10, 22, 34, 51 & 52	8, 72, 111, 121, 125, 131, 135, 136, 138 & 141
Name	Qualification
W. Braad	IWT (diploma nr. NL IWT-780)
C. de Haas	IWT (diploma nr. NL IWT-1238)
Responsible welding coordinator(s)	

Approval Certificate No:	Original Approval	:	27 October 2011
	Current Certificate	:	27 October 2014
	Certificate Expiry	:	26 October 2017

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THE NATIONAL BOARD OF BOILER & PRESSURE VESSEL INSPECTORS

Certificate of Authorization



This is to certify that

is authorized to apply the "NB" mark and register boilers, pressure vessels, or other pressure retaining items with the National Board in accordance with its provisions.

The scope of Authorization is limited to items manufactured in accordance with:

ASME Designator(s): U

ISSUE DATE: June 11, 2014

EXPIRATION DATE: April 17, 2017

Executive Director 



CERTIFICATE OF AUTHORIZATION

The named company is authorized by the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the certification mark and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this certification mark shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.


COMPANY: _____

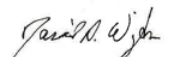
SCOPE: Manufacture of pressure vessels at the above location only

AUTHORIZED: May 21, 2014 REVISED: October 9, 2014


EXPIRES: April 17, 2017

CERTIFICATE NUMBER: _____

 Vice President, Conformity Assessment


 Director, Conformity Assessment

The American Society of Mechanical Engineers



THE NATIONAL BOARD OF BOILER & PRESSURE VESSEL INSPECTORS

Certificate of Authorization



This is to certify that

is authorized to use the "R" SYMBOL in accordance with the provisions of the National Board.


The scope of Authorization is limited as follows:


METALLIC REPAIRS AND/OR ALTERATIONS AT THE ABOVE LOCATION AND EXTENDED FOR FIELD REPAIRS AND/OR ALTERATIONS CONTROLLED BY THIS LOCATION

CERTIFICATE NUMBER: _____

ISSUE DATE: JULY 27, 2012

EXPIRATION DATE: JULY 17, 2015

Executive Director 



NB 243 Rev. 4

Certification – Accreditation help by said organisation:

ISO 9001, ISO 3834-2, Boiler Pressure Vessel "U" Stamp and "R"

ASME Certificate of Authorization for the manufacture of pressure vessels

Case Study 1 (Of Many)

Outcome for the UK duty Holder (Who assumed everything was code compliant) and installed the equipment offshore:

- 1. Underwent in depth scrutiny from the Regulator HSE**
- 2. Carried out very expensive advanced UT on the vessel with limited confirmation of true integrity of the vessels, due to weld geometry and dissimilar metal issues. And continues to repeat the inspections as part of its asset integrity management program.**
- 3. Undertook detailed critical engineering assessment to establish fitness for service.**
- 4. The vessels operates under a question mark and has had minor leaks.**
- 5. Questions still remain over the vessels operating life that could lead to further incurred cost to the duty holder**

Normalised Deviance

Normalized deviance refers to the phenomenon where deviations from standard practices, safety rules, or expected norms become accepted over time within a group or organization.

This acceptance occurs even when these deviations increase risks or lead to potential failures. It often stems from repeated success despite non-compliance, creating a false sense of safety

Case Study 1 (Of Many)

Regulatory Breach by Duty Holder:

The Management of Health and Safety at Work

Regulations 1999 Regulation 5. (1) Every employer shall make and give effect to such arrangements as are appropriate, having regard to the nature of his activities and the size of his undertaking, for the effective planning, organisation, control, monitoring, and review of the preventive and protective measures

Case Study 2 (Of Many)

Management and Inspection of a repair to a 3" nominal bore branch line off a Safety Critical 16" Hydrocarbon line on an offshore asset.

A duty holder identified remedial actions on an in-service Safety Critical hydrocarbon line on one of their offshore assets. Detailed up front design and welding engineering work identified problems with weld proximity issues. The duty holder Welding TA and the prime contractors welding engineer developed a very detailed welding simulation trial to qualify the suitability of the proposed welding Procedure. The emphasis on this repair weld was further increased in that it was designated a "Golden weld" i.e. it was not possible to carry out a hydrotest on the line after completion of the weld.

A work pack was produced by the prime Contractor employed by the duty holder for the enactment of fabric maintenance. All well and good?

Case Study 2 (Of Many)

While the work pack outlined quality – inspection requirements including detailed instructions in the form of an Engineering Query from the prime contractors welding engineer calling up in-process monitoring. Including as a minimum examination of:

- **Joint preparation and cleanliness**
- **Preheating**
- **Fit-up, joint clearance and internal alignment prior to joining**
- **Compliance with variables specified by WPS (In-process Monitoring)**
- **Slag removal and weld condition between passes**
- **Appearance of the finished joint.**

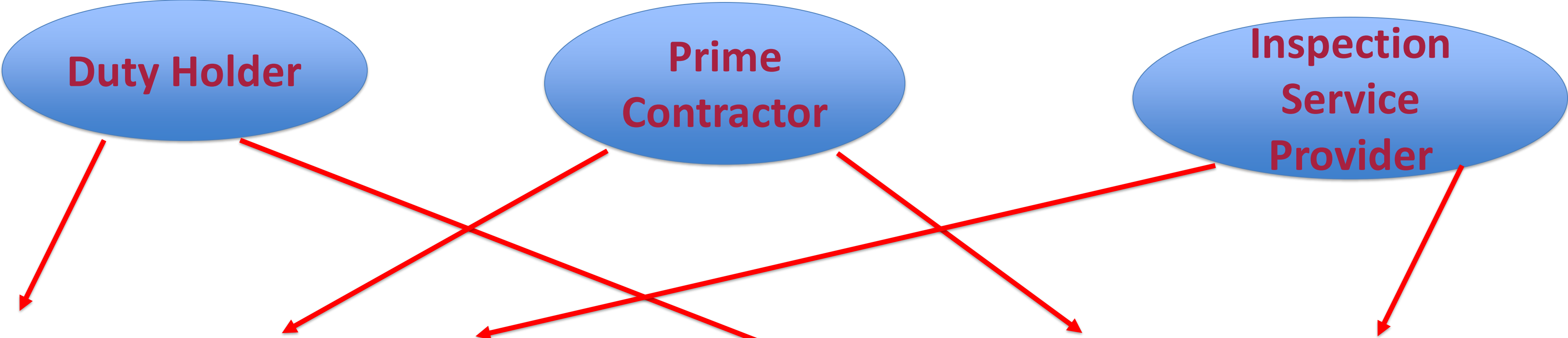
No mention made on the checks such as consumables material certs and welder qualification and identification etc. Duties of a welding inspector??

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This was offered up as the only Evidence or record to confirm Compliance to the detailed Safety critical welding Procedure. Worryingly a review of the welding inspectors CV Indicated he had extensive knowledge and experience??

Case Study 2 (Of Many)

Regulatory Breach's by those involved:



The Management of Health and Safety at Work Regulations 1999 Regulation 5. (1) Every employer shall make and give effect to such arrangements as are appropriate, having regard to the nature of his activities and the size of his undertaking, for the effective planning, organisation, control, monitoring, and review of the preventive and protective measures

The Provision and Use of Work Equipment Regulations 1998 Suitability of work equipment Regulation 4.(1) Every employer shall ensure that work equipment is so constructed or adapted as to be suitable for the purpose for which it is used or provided.

Case Study 2 (Of Many)

**Again, it is worth noting that the Prime Contractor held ISO 9000 accreditation and ISO 3834 Certification for the management welding and fabrication.
The inspection service provider also holds ISO 9000 accreditation and UKAS Certification**

(It must be stressed that like most NDT Inspection companies the UKAS certification they hold does not cover welding Inspection)

Case Study 2 (Of Many)

This is a classic example of just getting on with the job regardless

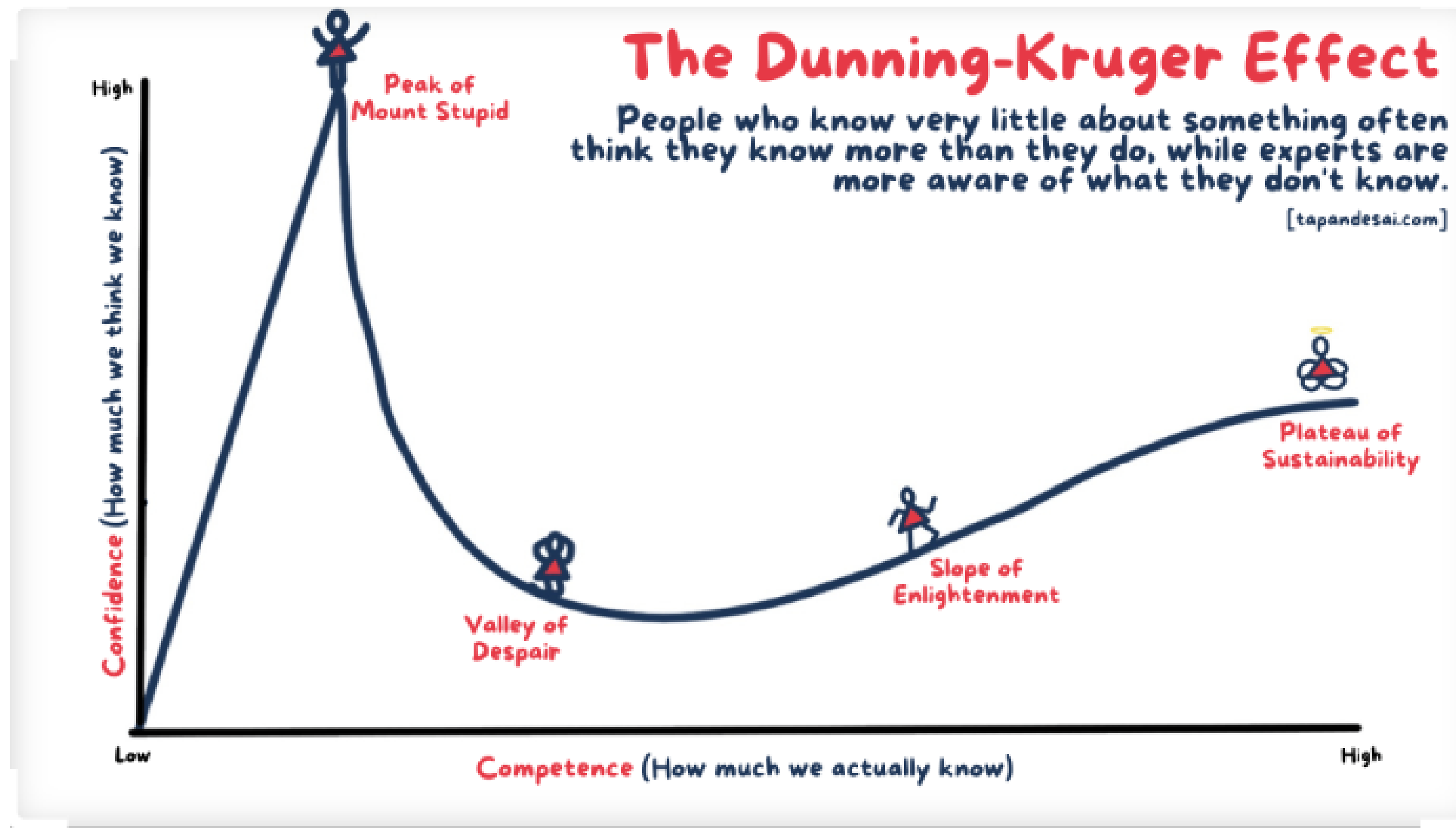
Or

Normalised Deviance

(Interestingly the work pack was signed off as completed by a senior operations engineer on the platform.)

No evidence of review for compliance by the onshore engineering team.

Dunning Kruger Effect “THIS SO TRUE IN WELDING ENGINEERING”



I have never meet a welding inspector QA/QC or project engineer who do not think they are Expert Welding Engineer. !!!!!!!

Chartered Mechanical Engineers with a CSWIP Welding Inspection Certificate that Lapsed 15 years ago acting as Designated Materials and Welding Technical Authority.

HSE Advisors that dismiss concerns because their previous employer ignored welding issues

Final Message

**One of the basic tenants of Health and Safety Law is “As Low As Reasonably Practicable”
(ALARP)**

**To ensure that welding is carried out correctly and is fit for purpose,
to reduce the risk of failure to ALARP,
it is essential**

**that an appropriate levels of in process monitoring are carried out
along with all the other recognised duties of a welding Inspector.
That the monitoring and inspections are recorded, to ensure traceability
and accountability of this special process**