

PETRONAS TECHNICAL STANDARDS

MAINTENANCE MANAGEMENT

PROCEDURAL SPECIFICATION

RADIOGRAPHIC INSPECTION

PTS 71.00.08.30

SEPTEMBER 2009



© 2010 PETROLIAM NASIONAL BERHAD (PETRONAS)

All rights reserved. No part of this document may be reproduced, stored in a retrieval system or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

PTS Circular 2009 - 1



PTS No:	71.00.08.30
PTS Title:	RADIOGRAPHIC INSPECTION

This revision of PTS **71.00.08.30 – RADIOGRAPHIC INSPECTION (Sep 2009, Revision 1)** was previously numbered 50.014 & has been updated to incorporate PETRONAS Lessons Learnt, Best Practice and new information issued by relevant industry code and standards. All updates in the document are highlighted in *italic font*.

The previous version of this PTS **50.014 (May 1991)** will be removed from PTS binder / e-repository from herein onwards.

The custodian of this PTS is:

Name : Zamaluddin Ali

Tel. No : 603 – 2783 6487

Please direct any questions regarding this PTS to the above-named.

Document Approval

	Name	Designation	Date	Signature
Prepared/ Reviewed	Norzafray Norhalim	Engineer (Inspection)	11 Sep 09	
Approved	Zamaluddin Ali	Principal Engineer (Inspection)	11 Sep 09	
Verified	Che Wan Ibrahim Che Wan Sudin	Head, Materials, Corrosion & Inspection, GTS	11 Sep 09	
Verified	Pau Kiew Huai	General Manager, Engineering, GTS	14.9.09	
Endorsed	Pramod Kumar Karunakaran	Senior General Manager, GTS	5.10.09	

Revision History

Rev No.	Reviewed by	Approved by	Date
1	Norzafray Norhalim	Zamaluddin Ali	11 Sep 2009

PREFACE

PETRONAS Technical Standards (PTS) publications reflect the views, at the time of publication, of PETRONAS OPU/Divisions.

They are based on the experience acquired during the involvement with the design, construction, operation and maintenance of processing units and facilities. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good technical practice to be applied by PETRONAS' OPU/Divisions in oil and gas production facilities, refineries, gas processing plants, chemical plants, marketing facilities or any other such facility, and thereby to achieve maximum technical and economic benefit from standardisation.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where PTS may not cover every requirement or diversity of condition at each locality. The system of PTS is expected to be sufficiently flexible to allow individual operating units to adapt the information set forth in PTS to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use PTS they shall be solely responsible for the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will expect them to follow those design and engineering practices which will achieve the same level of integrity as reflected in the PTS. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal or its technical advisor.

The right to use PTS rests with three categories of users :

- 1) PETRONAS and its affiliates.
- 2) Other parties who are authorised to use PTS subject to appropriate contractual arrangements.
- 3) Contractors/subcontractors and Manufacturers/Suppliers under a contract with users referred to under 1) and 2) which requires that tenders for projects, materials supplied or - generally - work performed on behalf of the said users comply with the relevant standards.

Subject to any particular terms and conditions as may be set forth in specific agreements with users, PETRONAS disclaims any liability of whatsoever nature for any damage (including injury or death) suffered by any company or person whomsoever as a result of or in connection with the use, application or implementation of any PTS, combination of PTS or any part thereof. The benefit of this disclaimer shall inure in all respects to PETRONAS and/or any company affiliated to PETRONAS that may issue PTS or require the use of PTS.

Without prejudice to any specific terms in respect of confidentiality under relevant contractual arrangements, PTS shall not, without the prior written consent of PETRONAS, be disclosed by users to any company or person whomsoever and the PTS shall be used exclusively for the purpose they have been provided to the user. They shall be returned after use, including any copies which shall only be made by users with the express prior written consent of PETRONAS. The copyright of PTS vests in PETRONAS. Users shall arrange for PTS to be held in safe custody and PETRONAS may at any time require information satisfactory to PETRONAS in order to ascertain how users implement this requirement.

CONTENTS

1. SCOPE

2. DEFINITIONS

3. ABBREVIATIONS

4. REFERENCES

5. SPECIFICATION REQUIREMENTS

5.1 Personnel Qualification

5.2 Radiation Safety

5.3 Procedure

5.4 Equipment

5.5 Radiographic Films

5.6 Location Markers

5.7 System of Identification

5.8 Image Quality Indicator (IQI)

5.9 Diagnostic Film Length (DFL)

5.10 Radiographic Techniques

5.11 Quality of Radiographs

5.12 Geometric Unsharpness

5.13 Back Scatter Radiation Check

5.14 Density

5.15 Sensitivity

5.16 Film Processing

5.17 Viewing Facilities

5.18 Acceptance Criteria

5.19 Records and Reports

5.20 Packing of Film

6. APPENDICES

APPENDIX 1.

APPENDIX 2.

APPENDIX 3.

APPENDIX 4.

REVISION REGISTER

Revision No.	Date	Details of Revision
1	9/83	First Issue
2	1/84	Entirely NA
3	5/91	Revised Entirely

1. SCOPE

This Standard Engineering Specification describes the requirements for radiographic inspection of materials and fusion welds in all equipment including the following

- pressure vessel
- process piping
- on and offshore pipelines
- tanks
- offshore structures

1.2 The acceptance/rejection criteria of radiographic inspection of each equipment shall be as stated in the applicable contract document.

2. DEFINITIONS

Certification - written testimony of qualification

Company - shall mean PETRONAS and its Group of Companies and Subsidiaries/Associated companies.

Contractor - the party which enters into a contract with the Company for the execution of work as detailed in a written agreement.

Employer - corporate, private or public entity which employs personnel for wages, salary, fees or other considerations.

Qualification - demonstrated skill, training knowledge and experience required for personnel to properly perform the duties of a specific job.

Shall and Should - the word 'shall' is to be understood as mandatory and the word 'should' as strongly recommended to comply with the requirements of this Specification.

Training - the programme developed to impart knowledge and skills necessary for qualification.

Written Practice - the specific requirements which define the employer's procedure for the qualification and certification of non-destructive testing personnel.

3. ABBREVIATIONS

AELB - Atomic Energy Licensing Board, Malaysia.

ASTM - American Society for Testing and Materials.

IQI - Image Quality Indicator.

NDT - Non-destructive Testing

PCN - Personnel certification in non-destructive testing, the British National Scheme for personnel certification in NDT.

SES - Standard Engineering Specification.

TLD - Thermoluminescent dosimeter.

4. REFERENCES

ANSI/ASME V-	Non-destructive examination.
BS2600 -	Radiographic Examination of Fusion Welded Butt Joints in Steel.
BS2910 -	Methods for Radiographic Examination of Fusion Welded Circumferential Butt Joints in Steel Pipes.
DIN 54109 Part 1 -	Non-destructive testing; image quality of radiographs; concepts, image quality indicators, determination of image quality value.

5. SPECIFICATION REQUIREMENTS

5.1 Personnel Qualification

- all Radiographers and Assistant Radiographers shall be licensed by the Atomic Energy Licensing Board, Malaysia. (For work within Malaysia only).

5.1.1 Radiographer

- shall possess a valid NDT Level II certification in industrial radiography in accordance with the Employer's Written Practice or other recognised independent qualifications as determined by the Company.
- shall have at least 2 years experience in industrial radiography of tubular structures, pipelines and piping systems. This experience shall be shown by documented evidence.

5.1.2 Assistant Radiographer

- shall possess a valid NDT Level I certification in radiography.
- shall have at least 1 year of relevant experience as an assistant radiographer which is shown by documented evidence.

5.1.3 Radiographic Interpreters

The Contractor shall be proven trained, experienced and qualified radiographic interpreter certified by the employer to NDT Level II or to PCN Level II or equivalent.

The radiographer may also be the radiographic interpreter if he holds this qualification.

5.1.4 Employer Based Certification

The employer of the radiographers shall submit his Written Practice to the Company for review, approval and audit.

At the Company's sole discretion, mock-up tests shall be carried out to prove the competency of the proposed radiographers and interpreters.

5.2 Radiation Safety

For radiation safety, the following shall be adhered to:-

- Atomic Energy Licensing Act 1984 and its subsequent regulations. (For work in Malaysia only. For work outside Malaysia, the respective country's statutory requirements shall apply).

The Contractor shall submit his radiation safety and emergency to the Company for approval prior to the commencement of work.