

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

MANUALS

INSTRUMENT ENGINEERING PROCEDURES

PTS 32.31.00.10

SEPTEMBER 2009



© 2010 PETROLIAM NASIONAL BERHAD (PETRONAS)

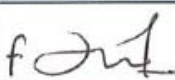
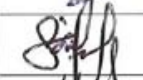
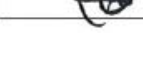
All rights reserved. No part of this document may be reproduced, stored in a retrieval system or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the permission of the copyright owner.

PTS Circular 2009 - SKG14/PTS/003	PETRONAS 
PTS No:	32.31.00.10
Publication Title:	Instrument Engineering Procedures
Base PTS Version:	<Release 13>

This revision of PTS **32.31.00.10 – Instrument Engineering Procedures** has been updated incorporating 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 (**December 2007**) will be removed from PTS binder/ e-repository from herein onwards.

Document Approval

	Name	Designation	Date	Signature
Initiator	Ezatolah Mardasi	Principal Engineer		
Reviewed		SKG 14 TPs	PTS Challenge Session 1 and 2 (FY08/09).	
Approved	V.R. Harindran	Custodian Engineer (Technical Authority), Instrument & Control, PA&O - GTS	13/10/09	
Verified	Saifol Mualim B Ahmad Yahaya	Senior Manager, Engineering - GTS	20/10/09	
Verified	Pau Kiew Huai	General Manager, Engineering - GTS	23.10.09	
Endorsed	Pramod Kumar Karunakaran	Senior General Manager, GTS	28.10.09	

Revision History

Date	Version	Description of Updates	Author

Summary of Changes

Section	Changes
2.2.1 DEMARCATION BETWEEN INSTRUMENT AND MECHANICAL ENGINEERING	The following clause were added: The following items form part of mechanical engineering, for which the relevant engineering information shall be supplied by instrument engineering, refer to PTS 32.31.00.32: 1. orifice flanges, orifice meter runs (made in accordance with Standard Drawing's). 2. Nozzles for level gauges. Level gauges shall be engineered and procured by Instrument engineering. Nozzle elevations and size shall be provided by instrument to mechanical department. Note: The design of level elevations to comply with process settings is part of instrument scope. 3. Nozzles for displacer and guided wave radar level transmitters. Displacer level transmitters shall be engineered and procured by Instrument engineering. Nozzle elevations and size shall be provided by instrument to mechanical department. Note: Displacer and guided wave radar level instrument are supplied complete with chamber, and as such shall be part of instrument engineering work. 4. Nozzles for thermowells. Thermowells shall be engineered and procured by Instrument engineering Note: Thermowell shall be purchased complete with temperature element, and transmitter from the transmitter supplier to avoid length, mismatch. 5. Safety/relief valves PSV, PRV, Vacuum Breakers, and Rupture discs. Note : Mechanical engineering shall engineer and procure Safety/relief valves PSV, PRV, Vacuum Breakers, and Rupture discs 6. Sample take-off points for analyzers. 7. Instrument air compressors, coolers, driers, buffer vessels and instrument air supply piping larger than DN 15, in accordance with the requirements of PTS 31.37.00.11 Note: Instrument air consumption shall be given by instrument department 8. Piping isometrics. Instrument group to give face to face dimension of all in-line instrument including control and on-off valves.

Section	Changes
2.4 THE BASIS FOR INSTRUMENT ENGINEERING	If changes in the design are considered necessary by the Contractor for safety, economic, safety, ease of operation, or other reasons, they shall only be carried out after obtaining the Principal's approval in writing.
2.5 INSTRUMENTATION OF EQUIPMENT PACKAGES	Additional clause added (bold): The instruments for equipment packages, such as boilers, incinerators, refrigeration equipment, compressors, etc., shall be of exactly the same make and type as those used for the process units. They shall be integrated with the requisition of the main process (control) instrumentation. The Principal shall review and approve the instrumentation package/system supplied by the vendor.

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 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, it is expected of 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 owner.

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.

TABLE OF CONTENTS

1.	INTRODUCTION.....	1
1.1	GENERAL	1
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS.....	1
1.3	DEFINITIONS.....	1
2.	GENERAL	2
2.1	INSTRUMENT ENGINEERING ACTIVITIES.....	2
2.2	DEMARCATIONS FOR INSTRUMENT ENGINEERING.....	3
2.3	DEMARCATION BETWEEN INSTRUMENT AND MECHANICAL ENGINEERING	3
2.4	DEMARCATION BETWEEN INSTRUMENT AND ELECTRICAL ENGINEERING.....	4
2.5	DESIGN DATA FOR INSTRUMENT ENGINEERING	4
2.6	THE BASIS FOR INSTRUMENT ENGINEERING	5
2.7	INSTRUMENTATION OF EQUIPMENT PACKAGES	5
3.	TIME SCHEDULE	6
4.	REQUISITIONING.....	7
4.1	GENERAL	7
4.2	REQUISITIONING PROCEDURES	7
4.3	INFORMATION IN REQUISITIONS.....	8
4.4	COMMENT/APPROVAL BY PRINCIPAL	8
4.5	ENGINEERING SPARES.....	8
4.6	FREE ISSUE ITEMS	9
4.7	PRELIMINARY REQUISITIONS	9
4.8	FACTORY INSPECTION	9
4.9	ERECTION/COMMISSIONING ASSISTANCE.....	9
4.10	REVISIONS	9
5.	SPARE PARTS FOR INSTRUMENTS	10
6.	COMPOSITE MANUALS	11
7.	FACTORY INSPECTION	12
7.1	DECISION FOR INSPECTION.....	12
7.2	INSPECTION.....	12
7.3	QUALITY ASSURANCE REQUIREMENTS.....	12
8.	DOCUMENTS AND DRAWINGS.....	13
9.	PLANT MODELS.....	14
10.	REFERENCES.....	15
APPENDIX		
APPENDIX 1	INSPECTION REQUIREMENTS	16

1. INTRODUCTION

1.1 GENERAL

This manual describes project engineering procedures for the design, requisitioning, testing and inspection of instruments.

The procedures are intended for use in oil refineries, chemical plants, gas plants and, where applicable, in exploration, production and new ventures.

Unless otherwise authorized by PETRONAS, the distribution of this manual is confined to companies belonging to or managed by PETRONAS, and to contractors nominated by them. All publications referred to in this manual are listed in [Section 10](#).

Where cross references are made, the number of the section or sub-section referred to is shown in brackets.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

1.3 DEFINITIONS

For the purpose of this manual the following definitions shall hold:

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 manual.

The **Principal*** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant, authorized to act for the Principal.

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction and commissioning for the project. The Principal may sometimes undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

2. GENERAL

2.1 INSTRUMENT ENGINEERING ACTIVITIES

In the context of this publication, instrument engineering comprises: The engineering and design activities required for the supply and installation of the awarded instrumentation and telecommunication equipment. This includes testing and inspection of instruments and systems at the Manufacturer/Suppliers facilities. Unless otherwise specified, the Contractor's Instrument Engineer shall be responsible for carrying out the activities as mentioned hereafter. These activities comprise at least the following:

1. Planning and scheduling the instrumentation work for the project within the overall project plan [\(3\)](#).
2. The checking of process engineering flow schemes, utility engineering flow schemes, functional logic diagrams and flow charts (functional description), and ~~to~~ generate the project instrument index.
3. Preparing and updating instrument data sheets.
4. The engineering calculations for all flow, level instruments, thermowell, and control valves.

NOTE: The measuring and control instrument calculations are normally done by contractor based on the process data provided by the process engineers. However, the final sizing/selection is done by the manufacturer/supplier, reviewed and accepted by the Contractor. Final approval of the calculation is by Principal.

5. The requisitioning of all instruments, accessories and installation materials [\(4.2\)](#).
6. The assessment of quotations, selection of suppliers from the list of preferred manufacturers checking copies of orders and supplier's data/drawings/documents.
7. The factory inspection of panels, systems, etc. [\(7\)](#).
8. Advising and assisting in the lay-out of instrument panels, operator consoles, control rooms, auxiliary instrument rooms, computer rooms, and analyzer house.
9. The design and engineering of alarm, and trip systems.
10. The design of analyzer system, including sample systems.
11. The configuration of control systems, including total sub-system integration.
12. The preparation of detailed documents and drawings for the ordering and installation of the instruments, etc. (see [8](#)).
13. The checking of plant models (see [9](#)).
14. Follow-up and progress control on all matters relating to instrument engineering.
15. The design, engineering and requisitioning of telecommunication facilities.
16. The preparation of 'as-built' drawings.
17. Generation of SAP material cataloguing for all supplied and spared instruments, including package units, following Owner's part number coding system in compliance with the manufacturer's part number.