

PETRONAS TECHNICAL STANDARDS

PROCEDURAL SPECIFICATION

PLANT MODEL AND CONSTRUCTION REVIEW

PTS 31.10.05.11

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This revision of **PTS 31.10.05.11 – Plant Model and Construction Review** 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 31.10.05.11 (January 2008)** will be removed from PTS binder / e-repository from herein onwards.

Document Approval

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PREFACE

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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's 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.

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1. INTRODUCTION

1.1 SCOPE

This PTS specifies requirements and gives recommendations related to the EPC phase for:

1. Block models.
2. 3D-CAD visualisation and use of 3D-CAD features.
3. Model review sessions.

Relevant sections of this PTS can also be used during the conceptual engineering phase. The level of detail should be agreed with the Principal.

Visualisation tools other than physical and 3D-CAD tools (e.g. virtual reality) are not covered by this PTS. The use of such tools is subject to the agreement of the Principal.

This is a revision of the PTS of the same number dated June 1996; a summary of the main changes is given in (1.5).

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by PETRONAS, the distribution of this document is restricted to companies forming part of or managed by PETRONAS and where necessary, to Contractors and Manufacturers nominated by them.

This PTS is intended for use in oil refineries, chemical plants, gas plants, exploration and production facilities and distribution storage depots and installations.

When PTSs are applied, a Management of Change (MOC) process should be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this PTS, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this PTS which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this PTS as closely as possible.

1.3 DEFINITIONS

1.3.1 General

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or a 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.

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, authorised to act for the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions and Abbreviations

3D-CAD: Three Dimensional Computer Aided Design

CAD: Computer Aided Design

PEFS: Process Engineering Flow Scheme

PFS: Process Flow Scheme

Very toxic (substances) *substances that are very hazardous for the environment or human health, as specified in PTS 01.00.01.30 (which also identifies "toxic" substances by reference to chemical substances databases).*

1.4 CROSS-REFERENCES

Where cross-references to other parts of this PTS are made, the referenced section number is shown in brackets.

1.5 SUMMARY OF CHANGES SINCE PREVIOUS EDITION

The previous edition of this PTS was dated July 1996; a summary of the main changes since the last edition is given below.

Old section	New section	Change
1.3.2	1.3.2	New "Very Toxic Substances" added

2. GENERAL

In the course of conceptual engineering the construction of a block model may be useful depending on the type, size and complexity of the plant. The block model may be a physical model or a 3D-CAD model

The block model should be used to establish the location of buildings, main equipment and main pipe routings.

As part of FED (Front End Development) a 3D-CAD model may be constructed. As part of detail engineering a 3D-CAD model should be constructed. When no 3D-CAD model is made the construction of a physical model should be considered.

A 3D-CAD system is a design tool for the Contractor and an integral part of the design and engineering process. The visualisation used for the 3D-CAD "model review" is only one of the features of a 3D-CAD system.

The model provides a visual check on safety, operability and maintainability and facilitates the engineering and erection of the units. It may also be used for the training of operators (including safety training) and for the planning of efficient maintenance schedules, to assist construction work (e.g. handling of heavy or large equipment) and commissioning planning.

3. MODEL REVIEW

3.1 GENERAL

The Principal shall perform formal model reviews to check that the arrangements meet the Principal's requirements. These reviews should be undertaken in detail, checking each system and using the PEFS to make item-by-item checks. The modifications initiated during previous model reviews shall be monitored.

The Contractor shall perform in-house model checks prior to the formal model reviews. The results of these in-house model reviews shall be documented and be reviewed during the formal reviews.

Any necessary changes shall be agreed upon and immediately recorded and shall be marked with reference numbers to avoid misunderstanding.

The 3D-CAD model used during the formal reviews shall be a frozen copy of the live engineering data base being used for development of the project. The status date shall be indicated.

4. BLOCK MODEL

4.1 GENERAL

The block model may be used for evaluating different lay-out options and to establish the location of main equipment and the main pipe routings, taking into account the required safety distances and accessibility for construction, operation and maintenance. After approval of the lay-out by the Principal, it can be used as a basis for preparing a more detailed (initial) plot plan drawing.

If a block model has been made it should be used as the basis on which a 3D-CAD model will be developed.

4.2 CONSTRUCTION

In a block model the equipment, buildings etc. shall be modelled in a simplified way. It shall be possible to make plant north, true north and prevailing wind direction visible.

Plant layout studies and piping studies form the basis of the model. These studies will also establish pipe track widths, structures, etc. The routing of main electrical and instrument cable trenches and access ways / roads should be shown.

A physical block model consists of wooden or plastic blocks, representing in a simplified form the equipment, buildings etc. The scale of a physical model should be 1:100. For offshore installations the scale should be 1:50 or 1:33.3.

4.3 SCOPE OF A BLOCK MODEL

4.3.1 Introduction

A block model may be set up during the conceptual engineering phase for one process unit or for multiple process units inclusive or exclusive the neighbouring facilities, buildings and structures.

A block model should include the items as given below.

4.3.2 Scope of a block model of the overall site

- Process/utility units.
- Buildings (e.g. control room, administration or workshop etc.)
- Interceptors.
- Effluent treatment facilities.
- Flare stack area.
- Jetties and marine facilities.
- Rail and road loading facilities.
- Blending plants.
- Pump stations.
- Roads.
- Storage tanks and tank farms.
- LNG/LPG storage facilities.
- Indication of fences.
- Pipe racks / pipe tracks / pipe trenches.
- Future extension Plot-determining equipment.
- Indication of space required for plot-determining piping.
- Structures.
- The routing of main electrical and instrument cable trenches.
- Elevation differences of the site "terraces"
- Helidecks, helipads and helicopter facilities.
- Hose handling areas.
- Laydown areas.
- Fixed cranes.
- Communication towers.
- Life boat stations.