

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

MANUAL

PIPE SUPPORTS

PTS 31.38.01.29

AUGUST 2009



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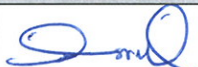
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This revision of PTS **31.38.01.29 – Pipe Support** has been updated incorporating PETRONAS Lessons Learnt, Best Practice and new information issued by relevant industry code and standards. All updates in the document are highlighted in *italic* font.

The previous version of this PTS (**January 2005**) will be removed from PTS binder/ e-repository from herein onwards.

This revision of PTS is also incorporating all guidelines and requirements from PTS **20.201 – Pipe Support** (June 1995), which consequently will be removed from PTS binder/ e-repository.

Document Approval

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21/07/09	1	This PTS has been reviewed/updated. All updates in the document are highlighted in <i>italic</i> font.	Asrul Hazimin

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.

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1. INTRODUCTION

1.1 SCOPE

This PTS specifies requirements and gives recommendations for the design and application of pipe supports in piping systems.

This PTS is a revision of the PTS of the same number dated December 1997. A set of Standard Drawings is available which includes the most commonly applied pipe supports, giving their allowable loads and identification.

This PTS is a revision of the PTS of the same title and number dated December 1997; a summary of the main changes from that edition is given in (1.5). A set of Standard Drawings is available which includes the most commonly applied pipe supports, giving their allowable loads and identification. For support selection charts, see Appendices 1 to 7.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by PETRONAS, the distribution of this PTS is confined to companies forming part of or managed by PETRONAS, and to Contractors nominated by them.

This PTS is intended for use in oil refineries, chemical plants, gas plants, exploration and production facilities and supply/marketing installations.

When PTS 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, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this document 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 document as closely as possible.

1.3 DEFINITIONS

1.3.1 General Definitions

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 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.

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, and on behalf of, the Principal.

The word **Shall** indicates a requirement.

The word **Should** indicates a recommendation.

1.3.2 Specific definitions

Where applicable, reference is made to the sections or appendices of this PTS, and/or to the relevant standard, where further details can be found.

Anchor	a device which restrains the pipe from movement and rotation in all directions. The member to which an anchor is fixed, however, may be subjected to displacements and/or rotations, e.g. connections to equipment	Appendices 3a, 3b and 4
Base support or pipe stanchion	a dummy pipe with base plate welded to the pipe. The pipe dummy will rest on the supporting structure and so support the pipe. When considerable site adjusting is required, the pipe stanchion may be of the 2-piece type, welded together after adjustment	Appendix 4
Clamp or clip	a device bolted around a pipe or, for cold insulation, around the insulation. Clamps form an integral part of hangers and clamped cradles or pipe shoes	BS 3974 and standard drawing S 44.043
Constant load support	a spring loaded support assembly or device designed such that the supporting effort is constant over the total travel of the support. Constant load supports are mainly used in pipes connected to strain sensitive equipment or for critical systems with large movements.	
Variable load support	<i>A spring loaded support assembly or device designed such that the resistance of the spring coil changes to the load of compression resulted from the weight and expansion of pipe.</i>	
Dummy leg	a dummy pipe welded to the pipe. The pipe dummy will rest on the supporting structure and so support the pipe	Appendix 7
Goal post support	frame type support for situations where heavy loads may be expected	BS 3974-2
Guide	a device controlling the direction of movement of piping/supports	Appendix 2
Guided support	a support allowed to move along a predetermined axis, controlled by guides	Appendix 2
Hanger	a support suspended from concrete floors, beams etc	BS 3974-1
Inserts	poured-in fixtures, in concrete floors or columns, allowing supports and/or hangers to be bolted	Appendix 8
Pipe shoe or cradle	a pipe support welded or clamped to a pipe	Appendix 1
Pipe stop	a device preventing the pipe from displacement in one direction may be applied in combination with a guide in an other direction	Appendix 2 and Appendix 3

Pivot	an element similar to a base support, but which allows the pipe to rotate around and to move along the longitudinal axis of that pivot. These supports are usually used as a sort of base support but they allow vertical movement and rotation while preventing lateral movement. Downward movement can be restricted with this type of support	Appendix 8
Rest support	Location where a pipe is resting with or without the application of a pipe shoe on the supporting structure	
Reinforcing pad or saddle	a plate welded to the pipe in order to reinforce thin-walled pipe to prevent the pipe from being damaged	Section 3.8
Rotating support	an anchor which allows the line to rotate around the longitudinal axis of that support but prevents vertical and lateral movement	Appendix 8
Shear lug	a welded attachment to the pipe at one or both sides of a clamped cradle or pipe shoe, preventing the pipe from slipping through the pipe support	Appendix 3 and standard drawing S 44.038
Snubber	a shock absorbing device, allowing the pipe to freely and slowly move whilst absorbing sudden shocks (e.g. seismic). It may be of the hydraulic, spring loaded or verge and verge wheel type.	
Sway brace	an adjustable spring or friction loaded device, usually applied for controlling vibration, absorbing shock loading, guiding or restraining the movement of the pipe and bracing against sway	BS 3974-1
Sway strut	an adjustable device, usually applied for restraining movement of piping in one direction while providing for movement in another direction.	
Spring hanger	a suspended spring loaded support	BS 3974-1
Spring support	a spring loaded assembly or device, supporting the pipe from underneath	Section 6 and BS 3974-1
Trunnion	a tubular supporting device, branching-off horizontally from a vertical line, and resting on, or suspended from, the supporting structure	Appendix 7 and BS 3974-1
U-bolt	a light-duty fixture, U-shaped, with both ends threaded and provided with nuts. These supports can be used as guiding points	BS 3974-1

1.4 CROSS REFERENCES

Where cross-references to other parts of this PTS are made, the referenced section number is shown in brackets. Other documents referenced by this PTS are listed in (7).

1.5 SUMMARY OF CHANGES SINCE PREVIOUS EDITION

The previous edition of this PTS was dated January 2005. A summary of the main changes since the last amended edition is given below.

Section	Subject
1.3.2	<i>Definition of Variable Spring Support added</i>
2	<i>General requirement of pipe support added (incorporation from PTS 21.201)</i>
3.4	<i>Prohibition on use of pipe stanchion as sliding support added</i>
3.5	<i>Supporting insulated lines in trenches added (incorporation from PTS 20.201)</i>
3.11	<i>General design for pipe sleepers added (incorporation from PTS 21.201)</i>
3.12	<i>Spring support requirements added</i>
3.13	<i>Additional requirement for lines connected to equipment added (incorporation from PTS 21.201)</i>
4	<i>Material requirement for stanchions, dummies and trunnions added (incorporation from PTS 21.201)</i>
6	<i>The word 'or' in "...shall have the marks "C" or "H"..." is replaced with 'and'</i>
Appendix 9	<i>Replace DEP 30.46.00.31 Gen. with PTS 30.46.00.31</i>

2. GENERAL

PTS 31.38.01.11 is applicable for the piping and specifies the required positioning of pipe supports.

Typical sketches and dimensions of pipe supports are given in BS 3974, MSS SP 58 and MSS SP 69.

Supporting of pipes is an integral part of piping design. If a 3D-CAD model is made, all supports shall be modeled. See PTS 30.10.05.11.

Standard pipe support details are given in the Standard Drawings listed in (7).

Pipe supports shall be designed so that access is provided for operation and maintenance.

The Contractor shall prepare a specification and a bill of material for pipe supports.

The **specification** for pipe supports shall contain:

- an index of the identification of the standard pipe supports;
- dimensional sketches of the standard pipe supports and/or a reference to applied standards;
- a description of the pipe support identification numbering system;
- the maximum allowable loading of the standard pipe supports;
- materials of construction;
- surface protection.

The **bill of material** for pipe supports shall contain:

- a list of the special pipe support identification numbers;
- a summary of the standard pipe supports;
- dimensional sketches of the special supports including materials of construction and surface protection;
- material summary sheets.

Supports shall be standardised as far as practical and shall bear an identification number. Special support identification numbers shall include the unit and/or area number.

A set of Standard Drawings is available which includes the most commonly applied pipe supports, giving their allowable loads and identification. For support selection charts, see Appendices 1 to 7.

The Contractor may use his own standards and/or commercially available pipe supports and methods provided they are equivalent with this PTS.

For centre-to-centre distance of supports for straight steel pipes and for bent steel pipe, see PTS 31.38.01.11.

For supporting glass-lined steel piping and plastic piping, the installation instructions of the supplier shall apply.

Galvanised supports shall not be used on austenitic stainless steel, duplex stainless steel, nickel alloy, or 9% nickel steel piping.

The location of supports shall allow for the removal of in-line instruments and equipment. Supports shall be located as close as possible to changes in direction, but shall allow adequate flexibility to the line concerned.

Supports in lines with expansion joints shall be designed and positioned in accordance with the requirements of the manufacturer and the standards of Expansion Joints Manufacturers Association (EJMA).

3. DESIGN

A pipe support selection flowchart is available in Appendix 9, which shall be used in conjunction with this section.

3.1 CLAMPED SUPPORTS

The position of clamped supports may be adjusted during construction to correct mismatches between the location of the support and the location of the supporting structure. These field modifications shall only be minor corrections and shall not lead to an increase of stresses and/or moments in the piping system and/or in the connecting nozzles.

Clamped supports are susceptible to corrosion because water may collect between the support and the pipe. If clamped supports are used in situations where corrosion may be expected, precautions shall be taken to protect the pipe and the supports against corrosion e.g. by avoiding the ingress of water under insulated pipes. Clamped supports require more maintenance than welded supports. To prevent galvanic corrosion, carbon steel clamps on pipes of other metallic materials shall be separated from the pipe by using a layer of synthetic rubber, glass fibre paper tape or other insulating material between the clamp and the pipe.

Clamped supports on hot pipes or on pipes with variable temperature may loosen because of the difference in temperature between the pipe and the clamp. In those situations weld-on shear lugs should be applied in order to avoid slipping of the pipe under the clamp. The paint of the pipe shall be repaired after welding the shear lugs. The application of goal post supports may avoid the clamp rotating over pipe when these supports are used as guides or as anchor points where excessive forces/moments may be expected.

Note: Clamped supports on insulated pipes may require a local increase of the insulation thickness to avoid the clamps penetrating the insulation outside cover. To avoid local insulation increases it should be considered to increase the insulation thickness of the complete pipe. For those situations welded supports may be a better choice.

3.2 WELDED SUPPORTS

Welded supports are less susceptible to corrosion than clamped supports. In order to install welded supports at the correct positions attention to these positions shall be paid during the detailed design phase. The field welds in the piping shall be used to correct differences in position during construction, caused by tolerances of the piping and the tolerances of the supporting structures.

Welded pipe supports shall not be used on the following piping:

- piping lined with glass, rubber, plastics, etc.;
- piping requiring post weld heat treatment;
- expensive materials such as titanium, Hastelloy, monel, etc.;
- piping with corrosion-resistant coating (e.g. galvanised piping).

Supporting steel parts welded to galvanised steel structures shall be attached to steel members before they are galvanised. Stainless steel piping shall be protected against zinc embrittlement which may result from molten zinc dripping from galvanised steel during a fire. See PTS 31.38.01.11.

3.3 HANGER SUPPORTS

Individual pipes may be suspended by hanger supports. Hanger supports shall not be used in systems with two-phase flow or where excessive vibration may be expected (e.g. near reciprocating compressors). Suspending a pipe from another pipe should be avoided.

Because the survivability of any type of hanger support in a pool fire is short and fire protecting of a rod is not reliable protection by e.g. a catch beam should be considered. For