

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

MANUALS

PLANT TELECOMMUNICATION

PTS 32.71.00.10

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This revision of PTS **32.71.00.10 – Plant Telecommunication (February 2011)** 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 **32.71.00.10 (July 1998)** will be removed from PTS binder / e-repository from herein onwards.

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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' OPUs 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 for equipment and systems used for plant telecommunication and for the selection and specification of such equipment and systems.

This PTS is a revision of the PTS with the same number dated July 1991.

This PTS is complementary to PTS 32.71.00.12. which deals with telecommunications for offshore platforms. Reference is made to PTS 32.71.00.11., 32.71.00.14., 32.71.00.16., 32.71.00.30. and 32.71.00.31. for details of specific telecommunication subsystems.

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 and Manufacturers/Suppliers nominated by them.

This PTS is primarily intended for use in oil and gas production facilities, but may also be used in oil refineries, chemical plants, gas plants and supply/marketing installations.

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 with respect to health, 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 objective of obtaining agreement to follow this PTS 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 or maintenance of a facility. The Principal may 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 and abbreviations

T1	American system of classifying ISDN bandwidth of 1.5 Mbit/sec
TDMA	Time Division Multiple Access
Tie line	A circuit between two private exchanges
BR	<i>Base Radio</i>
BTS	<i>Base Station Transceiver</i>
CCD	Charged Coupled Device
CCTV	Closed Circuit Television
City line	Sometimes referred to as an Exchange line . <i>or, as used in this PTS,</i> - circuit between a private exchange and a public exchange,
DOD	Direct Outward Dialling
DTMF	Dual Tone Multi-Frequency
DTRS	<i>Digital Trunked Radio System</i>
E1	European system of classifying ISDN bandwidth of 2 Mbit/sec
FAR	Field Auxiliary Room
FPFF	Fixed Position Fixed Focal length camera
Frequency bands	
HF	High frequency, 3 MHz-30 MHz
VHF	Very high frequency, 30 MHz-300 MHz
UHF	Ultra high frequency, 300 MHz-3000 MHz NOTE: VHF frequencies for industrial use are normally in the ranges of 70 MHz and 160 MHz. UHF frequencies for industrial use are normally in the range of 460 MHz or 900 MHz. The above frequency bands are heavily used and congestion is often experienced.
Hazardous area	As referenced in IEC 79-14, an area may be classified as Hazardous (Zone 0, 1, or 2) or Non-hazardous.
Intranet	A private information sharing service using public Internet technology
ISDN	Integrated Service Digital Networks
ITU-R	The International Telecommunications Union - Radio (located in Geneva, Switzerland)
ITU-T	The International Telecommunications Union - Telegraph and Telephone (located in Geneva, Switzerland)
2B+D	European system of providing ISDN channels. B = 64 kbit/sec and D = 16 kBit/sec. 2B+D consists of two channels of 64 kbit/sec (can be used for voice or

	data) and one of 16 kBit/sec (usually used for telephone signalling)
MDF	Main Distribution Frame
PABX	Private Automatic Branch eXchange
RCZ	Remote Controlled pan/tilt/Zoom/focus camera
SPC Exchange	Stored Program Controlled Exchange, that is a telephone exchange controlled by a computer
<i>TETRA</i>	<i>Terrestrial Trunked Radio</i>
Toll Ticketing	Recording the cost of a call

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 in this PTS are listed in (13).

2. GENERAL

2.1 USER REQUIREMENTS

The safe and efficient operation of a plant generally requires:

- voice communication between the control room and operators at various locations in the plant;
- video monitoring of critical equipment and critical areas;
- voice, data and e-mail communication between control room, attached offices, workshops and laboratories;
- voice communication with on-site contractors, customs and government inspectors;
- entrance control, intruder detection and communication with security staff (usually data, video and voice);
- voice, data, fax and e-mail communication with the import and export terminals or facilities;
- voice and pager communication with staff *and operators at various locations in the plant and in residential areas*;
- voice, data, fax and e-mail communication with the national 'main office' if this is not located within the plant boundary;
- voice, data, fax and e-mail communication with the third parties, both nationally and internationally.

Plants which are heavily integrated with other facilities, e.g. gas gathering or distribution networks have additional user requirements and will require detailed advice from the Principal.

The telecommunication requirements for the construction of a plant, particularly on a 'green field' site, require special consideration since they are not the same as for normal operation.

2.2 TELECOMMUNICATION AUTHORITY

Contact with the Telecommunication Authority (usually a department or agency of government) shall be made by the Principal for each project in which telecommunication is included.

The involvement of the Telecommunication Authority in plant communication systems varies from country to country. In some countries the authority has only to be assured that the interface of the plant telephone exchange to the public system meets their requirements (Type Approval), while in other countries the Telecommunication Authority is responsible for the complete supply and maintenance of the plant telephone system.

In all cases it shall be assured that those systems which are connected to the public communication network and all systems based on radio transmission (plant radio, paging) have the approval of the Telecommunication Authority.

If extensive private communications systems are required for construction and later operation of the plant, more extensive discussion with the regulatory authorities is needed (see PTS 32.71.00.31.).

It may often be difficult to obtain the necessary approvals from the Telecommunication Authority and application shall be made at the earliest opportunity. The approved radio frequencies need to be known before equipment can be ordered since the equipment is usually specially made.

2.3 SYSTEMS REQUIRED

The following systems or facilities are normally required:

- telephone system with connection to the public network;

- plant radio system;
- data system with connection to the 'main office' network;
- CCTV system;
- *public address and general alarm system*;
- security system;
- emergency call-out.

The following special telecommunication systems may be required:

- communication for marine loading terminal and facilities;
- communication for gas gathering and/or gas distribution network;
- temporary local, national and international communications for construction on 'green-field' sites.

3. TELEPHONE SYSTEM

The following sub-systems are required:

- wiring;
- telephone switch;
- telephone sets;
- connection to the public network.

3.1 WIRING

The following PTSs give guidance:

- within the battery limits of oil, gas or chemical plants see PTS 32.37.20.10.;
- for office buildings see PTS 32.71.00.30.;
- for residential areas and other off-plant locations see PTS 32.71.00.16.

3.2 TELEPHONE SWITCH

Guidelines affecting the choice of a telephone switch (PABX) are given in (Appendix 1).

Only telephone switches with local Type Approval shall be considered. See (2.2).

3.3 TELEPHONE SETS

A mixture of the following types of telephone sets may be required:

- wire-connected DTMF sets with ITU-T Q.23 DTMF signalling;
- wire-connected digital sets for ISDN use (2B+D) or a proprietary standard;
- radio-connected digital set.

It shall be clearly indicated where:

- each type of set has to be provided;
- additional features are required such as executive-secretary communications.

If telephone sets have to be installed in a hazardous area, the sets shall have the appropriate type of protection in accordance with IEC 79-14. The hazardous area classification of analyser houses shall be as specified in PTS 32.31.50.13.

For telephones installed outside the control room or offices, environmental protection shall be to a specified level of IEC 529.

Wire-connected digital telephone sets have a cable length limitation depending on the make and type which will prevent the use of such instruments in some locations. This shall be documented at the design stage and alternative solutions provided.

Radio telephones offer the advantage of portability but all such sets shall have a type of protection "EX-i" (intrinsically safe, preferably type "EX-ia") as specified by IEC 79-14, unless it can be guaranteed that they will not be carried into the plant, even accidentally e.g. in an emergency.

3.4 CONNECTION TO THE PUBLIC NETWORK

The telephone exchange shall be designed for direct connection to the public network without operator intervention so that direct inward and outward dialling is technically possible from any extension.

NOTE: The service class will allow specific telephones to access the public network.

The local telephone company should be consulted about the interface required. This may limit the makes and types of telephone exchange which can be considered. The preferred connection is E1 (2 Mbit/sec or 30 traffic channels) or multiples of E1 depending on the number of extensions which will be accessing city lines. T1 service may be offered in North America and some other countries.

3.5 BACK-UP FACILITIES

Continued operation of the telephone exchange and the ability to reach the public network is crucial, particularly during plant upsets and emergencies.

Modern telephone exchanges provide internal redundancy by having separate but linked independent units each serving 50 to 100 subscribers. When telephone lines are first assigned, critical subscribers shall be spread over more than one unit. The connection to the public network shall also be made from more than one unit.

The telephone exchange shall be supplied from a battery with sufficient capacity to run the telephone exchange with full traffic for at least 8 hours in the event of mains power failure.

The following alternative means of communication shall be provided in the event of a PABX fault:

- direct outgoing telephone lines by-passing the plant telephone exchange;
- direct lines (hot lines) to the local community Emergency Services and to utility companies.

4. PLANT RADIO SYSTEM

For very small plants, a radio system consisting of a main station in the control room and a number of handheld radios all operating on a single radio frequency should be adequate. For all other plants, a trunked radio system should be chosen since this will provide the necessary flexibility and a framework for growth. The number of handheld radios needed will depend on the operating philosophy of the plant. Discussions should be held with the operations department at an early stage.

Most private radio systems use the 450 or 900 MHz bands but higher frequencies may be allocated if there are many other users in the area.

4.1 TRUNKED RADIO

Digital trunked radio system (DTRS) based on TETRA standard shall be used to enable inter-operability between different manufacturers. The system shall occupy the frequency band of 380-400MHz as regulated by the MCMC.

The system shall have a minimum of one Base Station Transceivers (BTS) to cover a single site, and for redundancy purpose, a minimum of 2 Base Radios (BR) shall be employed in the BTS. The combined two BR will provide 8 TDMA slots which are divided into 1 Control Channel and 7 Traffic Channels. In this configuration, the system can support 7