



RP 30-9

INSTRUMENTATION AND CONTROL

**DESIGN OF INSTRUMENT
DATABASE SYSTEMS**

July 1994

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BP GROUP RECOMMENDED PRACTICES AND SPECIFICATIONS FOR ENGINEERING											
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SCOPE AND PURPOSE This document provides guidance, enabling a project/site to specify particular requirements for an instrument database system Early definition of the requirements for such systems can enable maximum benefit to be obtained from it and may in some cases save many man-hours of re-work or duplicated effort during the lifetime of an installation.											
AMENDMENTS <table border="0" style="width: 100%;"> <tr> <td style="width: 15%;">Amd</td> <td style="width: 25%;">Date</td> <td style="width: 25%;">Page(s)</td> <td style="width: 35%;">Description</td> </tr> <tr> <td colspan="4"> </td> </tr> </table>				Amd	Date	Page(s)	Description				
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FOREWORD

Introduction to BP Group Recommended Practices and Specifications for Engineering

The Introductory Volume contains a series of documents that provide an introduction to the BP Group Recommended Practices and Specifications for Engineering (RPSEs). In particular, the 'General Foreword' sets out the philosophy of the RPSEs. Other documents in the Introductory Volume provide general guidance on using the RPSEs and background information to Engineering Standards in BP. There are also recommendations for specific definitions and requirements.

Value of this Recommended Practice

This Recommended Practice provides guidance to the development of instrument database systems enabling maximum benefits to be derived. This is achieved by ensuring that they can be used throughout the life of the installation from design through to operations. This will include integration into existing site systems where appropriate.

Application

Text in *italics* is Commentary. Commentary provides background information which supports the requirements of the Specification, and may discuss alternative options.

This document may refer to certain local, national or international regulations but the responsibility to ensure compliance with legislation and any other statutory requirements lies with the user. The user should adapt or supplement this document to ensure compliance for the specific application.

Feedback and Further Information

Users are invited to feed back any comments and to detail experiences in the application of BP RPSE's, to assist in the process of their continuous improvement.

For feedback and further information, please contact Standards Group, BP International or the Custodian. See Quarterly Status List for contacts.



1. INTRODUCTION

- 1.1 The execution of projects, whether executed alone, as a re-instrumentation project or as part of a complete multi-discipline project, requires the generation and manipulation of large amounts of data. In order to fully realise the benefits of instrument database systems throughout the lifetime of a project, it is necessary to fully address the requirements of the system prior to setting up the database and entering data into it. This Recommended Practice identifies the decisions and assumptions which have to be made to clearly define the type and size of databases. This Recommended Practice does not provide specific recommendations for the use of specific hardware or software.
- 1.2 The users of the instrument database may be quite varied and also there may be requirements for interface with other discipline systems. It is essential, therefore, that all contributors and users of the databases are identified and fully involved in the development of the system definition to ensure that all interested party requirements are accommodated.

2. DATABASE USERS

- 2.1 The users of the instrument databases need to be identified. This may include sub-divisions within the control and instrumentation disciplines, other design disciplines and the various project and operational groups involved which may require access or input to the data or database structure.

The users (and areas of data requirements) may include but not necessarily be limited to:-

- *Instrument (Field instruments, valves, cables, bulks)*
- *Control (DCS, ESD, Fire and Gas)*
- *Electrical (Interface signals and indications)*
- *Process (P & ID development, alarm/trip registers, process data)*
- *Piping (Isometric attachments, materials take off, location, access)*
- *Vessels (Vessel attachments, material take off, control settings)*
- *Packaged Equipment (Full instrument/equipment data input)*
- *Planning and Costs (Progress and cost control)*
- *Purchasing (Requisitioning, expediting, inspection, site allocation)*
- *Construction (installation/material control, scheduling, test)*
- *Commissioning (Scheduling, test, set-up, progress reporting, certification)*
- *Operations (Process data and settings)*
- *Maintenance (Scheduling, performance monitoring, test, replacement detail)*
- *Safety (Change control, performance assurance, safety registers)*

Define whether these users require read/write or read only access.



- 2.2 The phases of the development over which the databases will be used should be identified to enable management of the data input and to ensure systems are in place prior to commencement of that phase of work.
- 2.3 Other database systems to be used also should be identified so that any necessary user interface of data can be managed to ensure consistency, ready interchange and update as necessary to meet the functional requirement.
- 2.4 Any proposals for incorporation of database systems for production of design and installation documentation should be identified and requirements included in the database systems assessment.

Care should be taken to ensure that any such requirements do not impose unacceptable restrictions as to vendors or hardware/software requirements. The need for customising of systems should also be avoided.

3. DATABASE STRUCTURE

- 3.1 The database structure should be such that there is only one prime location for a data record.
- 3.2 Where a single database record point structure cannot be achieved, rigorous control mechanisms should be implemented. It should be possible to only amend a data record through a nominated master record and any subsidiary record should then be updated by download from the master record. It should then be ensured that mechanisms are in place for regular update of the subsidiary record from the master record so that consistency of data is assured. The capability to amend records other than through the master record should be inhibited.
- 3.3 The number of data records that will be required should be estimated and the system storage and performance selected accordingly.

Databases have a tendency to increase as users firm up requirements. Estimates of data records should therefore be conservative and a minimum of 100% spare memory is recommended together with the scope for further expansion if this should be required.

- 3.4 Database records should be structured into directories and sub-directories as appropriate to the plant/installation and the area of system being dealt with.

For example:

*Plant Area/Module/Process System
Control/Shutdown/Fire and Gas*



4. DATABASE INFRASTRUCTURE

- 4.1 Consideration needs to be given as to where the users will require to gain access to the database system, the hardware through which access will be achieved and how the data accessible from that point will be updated. It should be ensured that there is consistency of data and, where necessary, regular updates made.
- 4.2 Wherever possible, common hardware/software should be used. Where this cannot be achieved, it needs to be ensured that communications for data update or access is proven and error free before implementation.
- 4.3 Access for data input and amendment should be rigorously controlled and only possible from nominated access facilities.
- 4.4 The following error checking facilities for manual data entry should be specified if required:-

Field length over-run

Repetition of unique identifier (tag number, DCS address etc.)

Syntax Check/Invalid Entry (Alphabet Fields)

Arithmetic Check/Out Of Range (Numeric Fields)

5. TAG NUMBERING SYSTEM

- 5.1 The tag numbering system to be utilised for an installation should be established after considering any specific operational requirement or existing site conventions that exist.
- 5.2 The tag numbering system used should take account of any limitations that may be imposed by other systems such as the DCS. The use of over-complex tag numbers should be avoided. Where additional identifiers are required these may be by use of additional search fields within the record data listing and not necessarily from part of the system tag number.

In some cases an abbreviated 'system tag number' is used for display of the tag number on the DCS or other system.

- 5.3 The allocation of loop numbers should be such that identification of plant area, system or function is readily understood. All items on a loop shall use the same loop number but be individually identified by the tag description and suffix where appropriate. Loop numbers should not be repeated for more than one loop.

- 5.4 The tag numbering system to be used for package instrumentation should be agreed. The approach used should avoid the need for customising of packages or documentation.

Tag numbers may be supplied to the package vendor by the contractor, or alternatively the contractor may add a prefix or suffix to numbers supplied by the vendor. The method chosen should minimise the transfer or documentation between the involved parties.

6. DATA FIELDS

- 6.1 The following parameters should be specified for each data field within the database:-

Field Name
Field Length (number of characters)
Alphabet or Numeric Input
Source of Data (manual entry or transfer from other system)
Valid Data Format

The format for valid data should define acceptable data entries for each field, e.g. field for Valve Failure Action could have valid entries only of OPEN, CLOSED, LOCKED, N/A.

Some fields may require alpha-numeric codes to be defined as valid entries. e.g. field for I/O type Code XX-YY

XX	=	AI Analogue Input	YY	=	4-20 mA internal power
		DI Digital Input			4-20 mA external power
		etc.			

- 6.2 Where the same field exists in several directories in the database, which directory is the master entry and which directories are updated from this directory should be defined.

For example the field for service description may be written to in the main instrument index, but may be read-only in the DCS sub-directory.

- 6.3 Identify any data fields which cannot be specified at this stage, but which will be required at later stages of the project.

Data fields relating to DCS addressing will depend on the particular DCS system. The DCS vendor may not be selected at the time the instrument database is set up.

- 6.4 The data fields required for the Instrument database needs to be agreed to ensure that all information required by the users is included. This should be restricted to essential only information in order to avoid excessive effort necessary to capture information of minimal benefit.

Data fields will typically include:-

*Tag Number
Service Description*

*Process Data
P & ID
Loop Sheet
Installation Drawing
System Reference
Hazardous Area
Manufacturer & Model No.
Calibration Range and Units
Alarm/Trip Set Point
Specification Detail
Inspection/Test Status
Date of Last Revision
Control/Valve Fail Action*

Other data fields may be included relating to DCS and safety systems configuration. However, these should be imported directly from the configuration database wherever possible.

Additional fields may be required by the designer/installer. However, these will not necessarily be required to be carried forward to the commissioning/operating phase.

7. DATA TRANSFER

7.1 Requirements for data transfer either to or from the database should be defined. For each transfer, the following should be considered to ensure that such transfers are effort free:-

- Database fields to be transferred
- Format of data fields
- Format of data file for transfer
- Medium for transfer (Network, Modem, Magnetic Disk/Tape)
- Frequency of transfer
- Automatic or manual initiation of transfer
- Error checking requirements for transfer

- (a) To the database
- (b) From the database

An example of transfer is from intelligent CAD P & ID's which may enter data into database fields such as tag number, line specification, and instrument type fields.

7.2 The reporting requirements for each transfer should be defined.

These may include:-

- Data transferred report
- Summary of changes report
- Revision level data/time/authority

7.3 Consideration should be given to testing data transfer using dummy data, to ensure accuracy before live transfer is attempted.

8. DOCUMENTATION

8.1 The requirements for production of documentation need to be defined. These may include, but not necessarily be limited to, the following:-

- Instrument Index
- Specification sheets
- Loop sheets
- Process Hook-ups
- Pneumatic Hook-ups
- Cable schedules
- Termination schedules
- Panel layouts
- Material takeoffs
- Purchase requisitions
- Certification-Commissioning/Handover

8.2 Documentation produced should be identified with title, date and revision number of issue, and any additional project specific requirements.

8.3 The hardware requirements for documentation production should be specified, and may include:-

- Printer type and resolution
- Plotters
- Paper size and orientation
- Report size



9. USER FUNCTIONS

9.1 Any particular user functions required should be specified. Basic user functions should include:-

- Create a record
- Delete a record
- Edit a data field
- Print reports
- Print screen
- Sort database (should include logical sort using AND, OR, NOT functions)

10. SYSTEM MANAGEMENT/SECURITY

10.1 The database access limitations should be defined and include restrictions to only permit:-

- Valid users
- Access only to defined user functions and database directories
- Read only or read/write access to database fields

10.2 Reporting/logging requirements should be defined to permit change control tracking and should include:-

- Report of change by specified user
- Report of change in specified period
- Report of change on specified area

10.3 Backup and archiving of data is essential for security and formalised procedures and system design should consider requirements for:-

- Automatic/manual initiation
- Frequency of backup and archiving
- Backup medium (hard disk, optical disk drive, floppy disk, tape)

10.4 Comprehensive system maintenance and support is essential for secure operation and should be defined before systems are put into operation.

DEFINITIONS AND ABBREVIATIONS**Definitions**

Standardised definitions may be found in the BP Group RPSEs Introductory Volume.

Abbreviations

CAD	Computer Aided Design
DCS	Distributed Control System
ESD	Emergency Shutdown System
I/O	Input/Output
P & ID	Piping and Instrumentation Diagram



LIST OF REFERENCED DOCUMENTS

A reference invokes the latest published issue or amendment unless stated otherwise.

Referenced standards may be replaced by equivalent standards that are internationally or otherwise recognised provided that it can be shown to the satisfaction of the purchaser's professional engineer that they meet or exceed the requirements of the referenced standards.

None



EXAMPLES OF INSTRUMENT DATABASE GENERAL SPECIFICATIONS

Report BPE.91.ER.164	Functional Specification for DCS Design and Configuration Tools
Report BPE.91.ER.165	Experience of DCS Off-Line Design and Configuration Tools
Report BPE.90.ER.013	General Statement of Requirements for an Instrumentation Database System
PAR Re-instrumentation Project	(I. de Snoo/D. Grylls)
GIDS Documentation System Close Out Report	
Bruce Area Development	Instrument Strategy Computer Point Index Guide

Note: The above documents are available within the BP Group on application to the Custodian of this Recommended Practice.

