



GS 130-8

Guidance for Specification 130-8

**SPECIFICATION FOR THE
SUPPLY OF CONTROL SYSTEMS**

January 1994

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BP GROUP RECOMMENDED PRACTICES AND SPECIFICATIONS FOR ENGINEERING											
Doc. No. GS 130-8		Issue Date January 1994	Latest Amendment Date								
Document Title SPECIFICATION FOR THE SUPPLY OF CONTROL SYSTEMS											
APPLICABILITY Regional Applicability: International											
SCOPE AND PURPOSE This document specifies the minimum requirements for the design of Control Systems. Its purpose is for the specification of fit-for-purpose Control Systems at minimum cost.											
AMENDMENTS <table border="0" style="width: 100%;"> <tr> <td style="width: 10%;">Amd</td> <td style="width: 20%;">Date</td> <td style="width: 20%;">Page(s)</td> <td style="width: 50%;">Description</td> </tr> <tr> <td colspan="4"> </td> </tr> </table>				Amd	Date	Page(s)	Description				
Amd	Date	Page(s)	Description								
CUSTODIAN (See Quarterly Status List for Contact) Control & Instrumentation											
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CONTENTS

Section	Page
FOREWORD	ii
1. INTRODUCTION	1
1.1 Scope	1
1.2 Functional Specification Guidelines.....	1
2. SYSTEM REQUIREMENTS	1
3. ADVANCED CONTROL AND OPTIMISATION.....	5
4. FIELD MOUNTED EQUIPMENT	6
5. TESTING	6
6. DOCUMENTATION.....	6
APPENDIX A.....	9
DEFINITIONS AND ABBREVIATIONS	9
APPENDIX B.....	10
LIST OF REFERENCED DOCUMENTS.....	10
APPENDIX C.....	11
FUNCTIONAL SPECIFICATION DATA SHEETS	11
C1.SYSTEM DESCRIPTION	11
C2.ENVIRONMENT, AREA CLASSIFICATION AND UTILITIES.....	13
C3.CONTROL SYSTEMS I/O SCHEDULE.....	15



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 Guidance for Specification

This Guidance for Specification identifies the minimum requirements for the design of Control Systems. The intention is to simplify the purchasing requirements when dealing with a known and mature supplier source.

Application

This Guidance for Specification is intended to guide the purchaser in the use or creation of a fit-for-purpose specification for enquiry or purchasing activity.

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.

Specification Ready for Application

A Specification (BP Spec 130-8) is available which may be suitable for enquiry or purchasing without modification. It is derived from this BP Group Guidance for Specification by retaining the technical body unaltered but omitting all commentary, omitting the data page and inserting a modified Foreword.

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 Scope

This specification, details the basic minimum requirements for the design of shutdown systems. For system procurement, this specification will need to be supplemented by details of the functional requirements for the specific application.

1.2 *Functional Specification Guidelines*

A functional specification should cover the following areas:-

Introduction

Scope of Supply:-

General

Testing

Documentation

Work by Others

Commissioning

Applicable Codes, Standards and Regulations

Special Requirements

Information Required with Quotation

Price and Delivery

Quality Verification

Appendices:-

System Description (see Appendix C1)

Environment, Area Classification and Utilities (see Appendix C2)

Input/Output Schedule (see Appendix C3)

2. SYSTEM REQUIREMENTS

2.1 The control system shall comprise the main operator interface with the plant for supervisory control and monitoring purposes. This operator facility shall interface with stand alone units for automatic plant control and status gathering.

2.2 The Supplier shall submit his proposal for the preferred method of Control System implementation to enable the functions to be performed with the required system availability/reliability, where specified. The supplier shall give consideration to proposal of alternative arrangements where significant cost savings or reduction in complexity/maintenance



burden can be demonstrated with minimal penalty to specified system performance.

The method of implementation of the Control System should be that most appropriate to the application and may include (but not necessarily be limited to) Distributed Control Systems (DCS), Supervisory Control & Data Acquisition (SCADA) or Telemetry system types of equipment.

Where equipment is software controlled, maximum use should preferably be made of Fixed Programme Systems or Limited Variability Systems. The use of Full Variability Systems should be minimised and restricted to those cases where it is necessary to develop bespoke software for a particular application, typically in a high level programming language. An established method for controlling and validating software development and subsequent modification shall be available.

2.3 The system shall provide facilities for process control and monitoring and sequencing. Other features required will include:-

(a) Process and plant monitoring and control displays.

Where already established, the use of colours and symbols on VDU displays should be in accordance with the End User's existing practice. In other cases, the Vendor's standard arrangement should be adopted where possible.

The design should take account of the process plant and utilities sub-systems and the proposed number of operators and the operating philosophy for each process unit or area.

Users restricted access will be required and may include process operators, supervisors, production controllers, engineers and programmers, other production and technical staff.

Deterministic digital transmission protocols are preferred and should be based on [IEEE 802.4](#). The use of non-deterministic protocols should be subject to agreement by the Project.

(b) Alarm and event processing, annunciation, first up indication, logging, sequence of event reporting.

Speed of response of alarm annunciation shall be adequate to ensure rapid operator information and response to cope with process upset or emergency conditions.

(c) Flow computation (non fiscal), totalisation and indication.

(d) Trend display, storage and retrieval.

(e) Operational and management reports.

(f) Logic and sequencing for plant startup, running control and routine shut down.

- (g) Operations inhibit facilities, manual shutdown facilities and resets.

Segregation of operational controls from Emergency Shutdown (ESD) functions shall be maintained. ESD controls, primary indications and action confirmation signals included in the Control System consoles shall be hardwired unless specifically agreed otherwise by the Project.

- (h) Continuous and comprehensive diagnostic monitoring and alarms.

System status and fault event alarms should be available on the appropriate displays of the operator and engineer consoles.

- (i) Capability to make use of the features available with smart field devices for operational and maintenance purposes.

- (j) Capability to compare signals with transmitters used on the shutdown system for early warning of measurement error.

Where multiple transmitters are provided for control and ESD functions, effectively measuring the same process conditions, benefit can be gained by comparing output signals to provide an indication of error or equipment failure. The necessity for separate routine testing of ESD initiating devices may be reduced as a result.

- (k) Provision for shutdown device status group monitoring and alarm in the event of shutdown device failure.

Dedicated status pages and alarms will provide the possibility to monitor for discrepancy or inconsistency between multiple final shutdown actuator devices.

- (l) Shutdown valve timing, operation cycle, trend reports and alarms.

Recording of valve timing, operation cycles and timing alarms will provide real time and historical data on the correct operation and sequence of shutdown valve actions for fault prediction and analysis and so minimise routine testing requirements.

In addition to the above, offshore/onshore oil production facilities shall include:-

- (m) Well choke control and gas lift control algorithms.

Well choke valves will normally require step-wise control to open or close the valve and are required to fail fixed (stay-as-is) on loss of the control signal.

- (n) Remote control and monitoring, production data gathering, and reporting to remote control centre onshore or gathering centre.

The degree of control, as against monitoring only, which is to be exercised from the location, shall be agreed in detail with the Project. Where control is required, a method shall be provided for determining which of the local or remote control stations takes precedence over the other.

Where such control can be exercised remotely from outside of the local Control System equipment, measures shall be taken to ensure the security of the data link from the remote station both in terms of data reliability and restriction of unauthorised data transmission and access.

2.4 The scope shall include all associated equipment hardware and consumables for satisfactory operation and maintenance, including (but not limited to):-

- (a) I/O interfaces, transmitter power supplies, signal conditioning and safety barrier devices, as required, for field equipment.
- (b) Workstations for operations and maintenance.
- (c) Printers (alarm, events).
- (d) Cabling for inter panels and consoles within control/ equipment rooms.
- (e) Magnetic media and printer consumables.
- (f) Facilities for screen dumping.
- (g) Gateway devices for interfacing other systems.

Other systems which may require gateway devices include other computers including Main Frame Computers, Personal Computers (PCs), Programmable Logic Controllers (PLCs) etc. and any devices communicating with the Control System via a serial data link.

- (h) Control panel section for telecoms equipment (radios/phones/public address etc.).

Apart from the provision of space, the Control System will not normally be interconnected with any of the console-mounted telecommunication systems.

- (i) Control panel sections for overview matrix sections of any associated Shutdown or Fire and Gas systems.

2.5 The Supplier shall demonstrate the overall system availability in operation, based on zero routine maintenance. The repair of any failure



should be effected quickly using the services of trained but 'non-expert' multi-trade technicians.

Any potential for a common mode failure shall be evaluated to determine if there is any effect on system integrity and operability.

The plant/operator interface should be designed so that no single fault can cause total loss of view of the status of the process. This may be provided by redundancy and/or provision of back up facilities.

Consideration should be given to the spare parts and engineering back-up support that may be required during system operation to ensure that the required availability is achieved.

- 2.6 For larger systems, where more than one cubicle section is involved, separate termination areas shall be provided connected via plugs and sockets. This is to allow for the termination of field cables prior to delivery of the main section of the panel.

3. ADVANCED CONTROL AND OPTIMISATION

- 3.1 Where specified by the Purchaser, the control system shall have the capability to execute advanced control and optimisation schemes. The supplier shall detail the system capabilities and limitations. Where not specified as a requirement, the supplier shall state the system capability for future introduction of such schemes and detail necessary additional equipment and software to execute.

- 3.2 The supplier shall detail the method of implementation and hierarchy with regard to both hardware and software. The integrity of the approach shall be such that failure of the advanced control or optimisation scheme does not result in loss of control of plant.

Details should include how functional blocks are linked and what safeguards are built in to deal with failure or corruption of the software or associated data.

- 3.3 Where the design of schemes is specified by the Purchaser as the responsibility of the supplier, all such proposals shall include full cost benefit justification.

- 3.4 The supplier shall demonstrate his capability and experience to carry out the work either in house or using an industry recognised specialist consultant.

4. FIELD MOUNTED EQUIPMENT

4.1 Field instrumentation equipment included in the supply shall be selected to ensure high reliability and low maintenance requirements.

4.2 Due consideration shall be given to minimisation of requirements for field cabling.

Any proposed use of serial links, multiplexing systems or of Fieldbus techniques need consideration of the methods for ensuring reliability of input and output signals to and from the field and effects of system failures.

4.3 All field mounted instrument equipment shall be weather proofed to IP 55, [IEC 529](#) classifications as a minimum.

5. TESTING

The supplier shall produce a detailed test procedure which will demonstrate design integrity along with the correct operation of each element of the Control System. The test procedure shall ensure that on-site testing and remedial work is minimised. All testing shall be recorded and all records retained for inspection for audit purposes.

The control panels shall be demonstrated to be immune to electromagnetic interference using project-specific sources for test purposes.

6. DOCUMENTATION

Documentation shall be provided to enable assessment of design. This should be limited to that essential to verify conformance with specified functionality and as necessary to permit installation, operation, calibration and maintenance of the system.

Requirements should be detailed in the functional specification and would consist typically of the following:-

(i) *Information Required With Quotation*

- *Detailed description of proposed system and any field equipment included in the scope.*
- *Software design philosophy, data structure, utilities and method of implementation.*
- *Reliability and availability assessment.*
- *List of applicable Codes and Standards and any deviations from these or this specification and associated documentation.*



- *Statement of capabilities and proposals for providing installation supervision (on/offshore) and testing/commissioning (on/offshore).*
- *Programme for construction, testing and delivery.*
- *Proposals for testing and commissioning.*
- *Spares and test equipment proposals together with prices.*

(ii) *Documentation Required During Design Build and Test*

Documentation must be limited to the minimum required to design the installation and to operate and maintain the equipment.

It should be recognised that it is the responsibility of the vendors to approve the detailed design drawings and not the design contractor. This is a new approach and will substantially reduce the volume of documentation required.

The specific documentation requirements will need to be defined by the design contractor for each particular application.

The prime objective is to eliminate unnecessary documentation, reformatting and approvals, thereby realising large savings in vendor and contractor costs.

It is suggested that the following is used as a basis for agreeing the documentation requirements:-

8 weeks after confirmation of order

- *Panel and console layout drawings.*
- *Panel power and heat load estimates.*
- *Wiring, electrical distribution, earthing and inter-connection drawings.*
- *System, database and highway loading estimates.*
- *Installation and terminal point details.*
- *Equipment lists, schedules and data sheets for input to operational maintenance database systems (where specified).*
- *I/O and interface schedules including signal state.*
- *Detailed spares and test equipment listings to cover commissioning and two year's operation.*
- *Functional design specification of any bespoke hardware, software or system configuration.*
- *Failure modes effects analysis*

8 weeks prior to Factory Test



- *Detailed procedure, programme and test sheets for system testing at the factory, on site commissioning and for subsequent routine operation and maintenance. These are to include for the system and any sub-vendors or ancillary equipment. Special requirements for testing interfaces to other systems shall also be included.*
- *Equipment safety certification dossier (as applicable).*
- *Operation and maintenance manuals with all information necessary for continued operation during the life of the installation.*

On delivery

- *As built documentation*
- *Confirmed weight and Centre of Gravity (offshore only or as specified)*

The document approval category requirements for the above will need definition for specific applications. The requirement for approval before continuation of manufacture should be minimised.



DEFINITIONS AND ABBREVIATIONS**Definitions**

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

Abbreviations

DCS	Distributed Control System
ESD	Emergency Shutdown
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
I/O	Input/Output
IP	Ingress Protection
PC	Personal Computer
PLC	Programmable Logic Controller
SCADA	Supervisory Control and Data Acquisition

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.

International Documents

[IEC 529](#) Degrees of protection provided by enclosures

American Documents

[IEEE 802.4](#) Token Bus LAN's



FUNCTIONAL SPECIFICATION DATA SHEETS

C1. SYSTEM DESCRIPTION

C1.1 General

-- HOLD --

(Note: Description of the project, location and application.)

C1.2 System Layout

-- HOLD --

(Note: Summary of system and any particular features/ requirements for this application - e.g.. geographical split, remote control etc.)

C1.3 Control Hierarchy

-- HOLD --

(Note: Description of the application requirements e.g. centralised supervisory control, outstation stand alone control, manual capabilities, remote control etc. This may also include requirements for advanced/ optimised control and management information.)

C1.4 System Availability/ Reliability

- HOLD -

(Note: This need not be a quantitative statement but more a statement of design principals, thus allowing the supplier to detail and propose optimum solutions.)

C1.5 Display and Operator Interface Arrangement

-- HOLD --

(Note: Detail process plant unit/ area/ operator breakdown.)



C1.6 Integration with other Systems

-- HOLD --

(Note: Describe functional requirements and request vendor to advise optimum solutions. Include details of any communication delays that may be encountered such as with satellite communications.)

C1.7 Advanced Control/Optimisation Requirements

-- HOLD --

(Note: Detail areas where proposals are required)

C1.8 Ancillary Console Mounted Equipment

(Note: Detail all third party equipment required to be mounted on the control consoles/ panels.)

C1.9 Special to Project Maintenance Facilities

-- HOLD --

(Note: Agree any special requirements with the Operator.)

C1.10 Critical Control Loops

- HOLD -

(Note: This can only be finalised when system failure modes are confirmed and process HAZOP considering these has been completed. This will identify any requirements for enhanced reliability or diversity.)



C1.11 *Device and Equipment/Panel Tag Numbering*

- HOLD -

(Note: Detail to fit project philosophy but with due regard to supplier system capability.)

C1.12 *Panel Maximum Noise Levels*

Control Room Panels: - HOLD -

(Note: Consider requirements for continuous manning.)

Equipment Room Panels: - HOLD -

(Note: Should be less onerous as usually not normally manned.)

C2. *ENVIRONMENT, AREA CLASSIFICATION AND UTILITIES*

Environmental Conditions and Area Classification

Field equipment

Field equipment will be subjected to a marine environment with a salt laden atmosphere.

<i>Max. ambient temperature</i>	<i>°C</i>
<i>Min. ambient temperature</i>	<i>°C</i>
<i>Max. Rel. Humidity</i>	<i>%</i>
<i>Area Classification</i>	<i>Zone</i>
<i>Gas Group</i>	<i>II</i>
<i>Temperature Class</i>	<i>T</i>

Central control/Field equipment rooms

The control/ equipment rooms shall be classified as a safe area and suitable for general purpose equipment such as control panels and printers.

<i>Max. ambient temperature</i>	<i>°C</i>
<i>Min. ambient temperature</i>	<i>°C</i>
<i>Max. Rel. Humidity</i>	<i>%</i>



Utilities and Services

Electrical power

1.	Voltage		V AC	V AC
	Frequency		Hz	Hz
	Regulation	-	VTA	
	Harmonic Distortion	-	VTA	
	Switching Transients	-	VTA	
2	Voltage		V DC	V DC
	Regulation	-	VTA	
	Ripple	-	VTA	
	Harmonic Distortion	-	VTA	

(Note: Degree of supply duplication to achieve required availability and fault tolerance - VTA)

Instrument Air

Inst. Air Pressure	barg (max.)	barg. (min.)
Dew Point	°C	

VTA - Vendor to advise with submission



C3. CONTROL SYSTEMS I/O SCHEDULE

NOTES

No. of Graphic Display Pages (No. of dynamic points/page.....)

[illegible]