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GP 44-40

Isolation of Equipment for Maintenance and Emergency

Group Practice

**BP GROUP
ENGINEERING TECHNICAL PRACTICES**

Foreword

This Engineering Technical Practice (ETP) was originally published 6 October 2006 as GP 35-20. This version of Group Practice (GP) GP 44-40 includes the following revisions:

- a. Amendments to the scope of this GP.
- b. Update of normative references in accordance with BP Group and segment defined ETPs.
- c. This GP has been moved from category 35 (Maintenance and Reliability) to category 44 (Plant Layout and Design).
- d. This GP title has been amended to “Isolation of Equipment for Maintenance and Emergency”.
- e. This GP addresses engineering requirements for isolation during maintenance and emergency. Operating requirements for isolation are addressed within operating management system (OMS) Standard GDP 4.5-0001 - Control of Work and associated OMS documents.
- f. Further discussion and descriptions of “valved isolations”.
- g. Requirements for isolation for emergency shutdown (ESD).

These changes were so extensive that revisions have not been indicated in the margin as is normal practice.

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1. Scope

- a. This GP provides requirements for selection, design, and installation of mechanical, electrical, instrumentation, and control equipment for isolation for maintenance and emergency.
- b. OMS document, GDP 4.5-0001 - Control of Work, and related documents reflect operating requirements associated with isolation and should be used in conjunction with this GP.
- c. This GP is applicable to design and installation of new plants and facilities and may be used for assessment and modification of existing plants and facilities.
- d. Each entity should develop a site operating practice to manage isolation of new and existing facilities.

The [Safe Isolation and Reinstatement of Plant \(SIRP\) document \(UKCS-SSW-001\)](#) provides guidance on various operational requirements for isolation and should be referred to when developing a site operating practice for isolation.

- e. This GP is applicable for design and operation of the following:
 1. Hydrocarbon processing plants, including refineries, natural gas installations, and chemical plants.
 2. Steam and/or power generating plants and ancillary equipment.
 3. Terminals, including jetty and loading facilities.
 4. Offshore installations, including floating production facilities and marine systems associated with offshore floating production facilities.
 5. Petroleum production facilities, including well pads, crude oil, and gas gathering centres.
 6. Storage installations.
 7. Utility systems.
 8. Components of drilling systems on BP operated platforms in which the drilling rig is an integral part of the facility. This GP does not cover mobile drilling rigs that are owned by others and assembled as required on the facility.

Although BP does not own or operate these mobile drilling rigs, in most circumstances, gaps and risks covered in this GP should be assessed when making the selection on a BP operated site.
- f. GP 78-14 provides requirements for isolation on subsea installations.
- g. GP 43-35 provides requirements for mechanical isolation on pipeline installations.

2. Normative references

The following referenced documents may, to the extent specified in subsequent clauses and normative annexes, be required for full compliance with this GP:

- For dated references, only the edition cited applies.
- For undated references, the latest edition (including any amendments) applies.

BP

GP 12-25	Earthing (Grounding).
GP 30-25	Field Instruments - General.



GP 30-40	Process Automation Systems.
GP 30-65	Control Panels.
GP 30-80	Safety Instrumented Systems (SIS) - Specification and Implementation.
GP 30-81	Safety Instrumented Systems (SIS) - Operations and Maintenance.
GP 42-10	Piping Systems (ASME B31.3).
GP 44-80	Relief Disposal and Depressurisation Systems.
GP 48-02	Hazard and Operability (HAZOP) Study.
GP 48-03	Layer of Protection Analysis (LOPA).
GP 48-04	Inherently Safer Design (ISD).
GP 62-01	Valves.

BP OMS Practices

GDP 3.1-0001	Assessment, prioritization, and management of risk.
GDP 4.5-0001	Control of Work.

British Standards Institute (BSI)

BS 6423	Code of practice for maintenance of electrical switchgear and controlgear for voltages up to and including 1 kV.
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Engineering Equipment and Material Users Association (EEMUA)

EEMUA 182	Specification for Integral Block and Bleed Valve Manifolds for Direct Connection to Pipework.
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National Fire Protection Agency (NFPA)

NFPA 59A	Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG).
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3. Terms and definitions

For the purposes of this GP, the following terms and definitions apply:

Confined space

Any enclosed area that is large enough for a person to enter or insert his head, has limited or restricted means of access and exit, and is not designed for normal or continuous occupation. This definition includes any space of an enclosed nature in which there is risk of death or serious injury from hazardous substances or dangerous conditions (e.g., lack of oxygen).

Emergency shutdown (ESD)

Automatically or manually initiated functions that result in isolation of a complete unit or facility to prevent or mitigate consequences of a hazardous event.

Flammable

Any substance (solid, liquid, or vapour) that may form a mixture with air at or above the lower explosive limit and below the higher explosive limit and is easily ignited. Addition of the prefix “non” (i.e., nonflammable) indicates that the substance is not readily ignited but does not necessarily indicate that it is noncombustible.



Flammable liquid

A liquid whose flash point does not exceed 37,8°C (100°F) when tested by closed-cup test methods, while a combustible liquid is one whose flash point is 37,8°C (100°F) or higher also when tested by closed-cup methods.

High voltage

Voltage exceeding 1 000 VAC or 1 500 VDC.

Isolation

Disconnection and separation of equipment from all sources of energy.

Low voltage

Voltage not exceeding 1 000 VAC or 1 500 VDC.

Spades

Blanks (blinds) made of metal and rated for the maximum design pressure that are installed between flanges for use as positive isolation devices.

Toxic service

Any gas vapour or liquid that is, is mixed with, or has picked up by contact in the process any substance(s) known to be hazardous to health or to the environment and if released from containment may exceed concentrations above the relevant occupational exposure limits or environmental limits.

4. Symbols and abbreviations

For the purpose of this GP, the following symbols and abbreviations apply:

BPCS	Basic process control system.
DBB	Double block and bleed.
DN	Nominal diameter.
EA	Engineering authority.
EDPV	Emergency depressuring valve.
ESD	Emergency shutdown.
ESDV	Emergency shutdown valve.
HAZOP	Hazard and operability (study).
HP	High pressure.
I/O	Input/output.
ISD	Inherently safer design.
LNG	Liquefied natural gas.
LOPA	Layer of protection analysis.
LP	Low pressure.



MCB	Miniature circuit breaker.
MCC	Motor control centre.
MCCB	Moulded case circuit breaker.
NPS	Nominal pipe size.
OMS	Operating management system.
P&ID	Piping and instrumentation diagram.
PLC	Programmable logic controller.
PSD	Process shutdown.
RTJ	Ring type joint.
SIS	Safety instrumented system.
SVI	Single valve isolation.
SPU	Strategic performance unit.
TA	Technical authority.
UPS	Uninterruptible power supply.

5. General

- a. This GP and relevant requirements herein should be considered minimum requirements for isolation.
- b. The highest quality and security of isolation that is reasonably practical in prevailing circumstances shall always be used.
- c. Consideration shall be given during design of new facilities to requirements for intrusive maintenance or internal inspection of equipment. Isolations that are required to enable these tasks to be performed shall:
 1. Be designed to be safe and effective without placing unnecessary constraints on plant operation.
 2. Align with plant sparing philosophy and plant availability targets.

Intrusive activities required for maintenance of plant and equipment could result in release of hazardous substances or stored energy. These intrusive activities should be managed through a combination of good design to maximise inherent safety and utilise a rigorous operating management process. The isolations required to perform a particular task can be complex, and hence, it is not possible to provide a generic system that will ensure the highest level of safety at all times. Therefore, this GP provides general principles concerning the major factors to be considered in designing plant and equipment that, if applied in combination with sound judgment, should enable risks associated with intrusive tasks to be managed effectively.



d. Sparing and maintenance philosophy

1. For projects, including modifications or additions to existing assets, normal and alternative modes of equipment operation should be clearly defined at an early stage, along with the sparing and maintenance philosophy.
2. This philosophy shall be used to establish the plant isolation requirements.
3. This philosophy should clearly establish the extent of equipment within a system that is to be included within isolation boundaries for intrusive maintenance.
4. ISD principles as defined in GP 48-04 should be used.

The type and expected frequency of maintenance required for individual equipment will often dictate the isolation boundaries. The isolation philosophy (number of isolations and locations within a system) should be designed, taking into account benefits of minimising isolations by isolating smaller sections versus isolating larger sections. Consideration needs to be given to safety issues of the isolation philosophy selected, including control of work, deinventorying, purging and leak testing, and reinstatement of the isolated system.

- e. Design of isolations should recognise the potential for human error and, if possible, incorporate features to minimise both the potential for human error and consequences of these errors.

The potential for human error significantly affects the overall reliability of an isolation method. Performance of isolations depends not only on the integrity of the isolation hardware but also on the adequacy of arrangements for identifying each isolation point, securing the isolation, proving/monitoring, and maintaining overall control of work. Incident analysis confirms that human failures cause or are involved in a large proportion of isolation failures.

- f. Project documentation should clearly provide the following information:

1. Alternative modes of operation using differing flow routes.
2. Requirements for intrusive operations (e.g., filter changeout, pipeline pigging, or sampling) and access into equipment for inspection and maintenance.
3. Isolation arrangements, including valve types, spading points or spectacle blinds, removable spool locations, test points, and associated vents and drains for venting, flushing, and purging.

For clarity, this information can be included within the project documentation or shown on the P&ID drawing, as appropriate.

- g. For spared or parallel operated equipment, isolation arrangements should allow complete segregation from online equipment for operational or maintenance reasons.
- h. During isolation, all isolation points shall be tagged with a unique reference to avoid any confusion with regard to which isolation point has been secured.
- i. Particular attention should be paid to deisolation of equipment. Adequate venting and pressure monitoring should be supplied.
- j. Operating permit to work procedure shall address operational isolation issues, such as specific isolation procedure, isolation integrity verification, monitoring isolation integrity, preparation of the work area, integrity recording, and reinstatement of equipment.
- k. Risk assessment
1. If it is not possible to achieve the required isolation defined in this GP due to limitations within the installed facilities or if a greater risk is incurred with installation of the isolation, a risk assessment approach shall be used to define the required levels of checks and controls necessary to achieve safe isolation.

