



RP 44-6

AREA CLASSIFICATION TO IP 15

June 1992

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BP GROUP RECOMMENDED PRACTICES AND SPECIFICATIONS FOR ENGINEERING											
Doc. No. RP 44-6		Issue Date June 1992	Latest Amendment Date								
Document Title AREA CLASSIFICATION TO IP 15 (Replaces BP Engineering CP 39)											
APPLICABILITY Regional Applicability: International Business Applicability: All Businesses											
SCOPE AND PURPOSE This Recommended Practice specifies BP general requirements for area classification around equipment producing or handling flammable fluids. It supplements the Institute of Petroleum Model Code of Safe Practice Part 15 Area Classification Code for Petroleum Installations (March, 1990). It provides detailed guidance for petroleum fluids and for flammable fluids similar in physical characteristics to petroleum fluids.											
AMENDMENTS <table border="1"> <thead> <tr> <th>Amd</th> <th>Date</th> <th>Page(s)</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td colspan="4"> </td> </tr> </tbody> </table>				Amd	Date	Page(s)	Description				
Amd	Date	Page(s)	Description								
CUSTODIAN (See Quarterly Status List for Contact) Chemical Engineering, BPE											
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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

It clarifies certain of the [IP 15](#) requirements and lists those additional BP requirements, e.g. onshore pumping wells, not fully detailed in [IP 15](#).

Application

This Recommended Practice is a transparent supplement to the [Institute of Petroleum Model Code of Safe Practice Part 15 Area Classification Code for Petroleum Installations](#) (March, 1990) subsequently referred to as [IP 15](#). The titles and numbering of the text of this BP Group Recommended Practice after Introduction follow those of [IP 15](#). All text is cross referenced and qualifies, modifies or adds to the requirements of [IP 15](#).

Text in italics is Commentary. Commentary provides background information which supports the requirements of the Recommended Practice, and may discuss alternative options. It also gives guidance on the implementation of any 'Specification' or 'Approval' actions; specific actions are indicated by an asterisk (*) preceding a paragraph number.

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.

Principal Changes from Previous Edition

Now supplemental to [IP 15](#).

Feedback and Further Information

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

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



INTRODUCTION

1.1 Scope

This Recommended Practice specifies BP general requirements for Area Classification around equipment producing or handling flammable fluids and has the same scope as the [Institute of Petroleum Model Code of Safe Practice Part 15](#), except where noted otherwise at the head of each Chapter in this Recommended Practice. It provides detailed guidance for petroleum fluids and for flammable fluids similar in physical characteristics to petroleum fluids.

See Appendix C1 for Commentary.

(NOTE. THE CHAPTERS AND PARAGRAPH NUMBERING REFER TO THE NUMBERING IN IP 15)

CHAPTER 1

INTRODUCTION

1.3 Safety Principles Fundamental to Area Classification

1.3.2 Good Standard of Design and Operation

*

The area classification technique described here and the distances recommended assume that the facility to which they are applied is designed, constructed, maintained and operated generally in accordance with good industry practice. This means that installations should be designed to BP Group Recommended Practices and Specifications for Engineering or to other codes and standards approved by BP as technically acceptable alternatives.

(Substitution for [IP 15](#) 1.3.2)

1.4 The Management of Area Classification

*

A person, normally a senior manager, shall be identified and appointed to be responsible for area classification. The responsible person shall approve the classification but may delegate authority for the work to others. The work, which requires an interdisciplinary approach, should be carried out by engineers who have knowledge of the process systems and equipment, in consultation with safety and electrical engineering personnel as appropriate. Agreements reached on area classification shall be recorded formally. The form shown in Figure 1 may be used. Such records, whether drawings or tabulated data sheets, shall include the extent of the hazardous area, both horizontally and vertically, and



details of the apparatus sub group and temperature class appropriate to the area. There is no requirement to include details of the type of protection. Area classification carried out for BP by a third party, i.e. contractor or consultant, shall be approved by BP.

(Substitution for to [IP 15](#) 1.4 first para)

On management, this amendment requires that the person responsible for area classification has sufficient authority and seniority to select a competent team but there is no requirement for him/her to be involved in the detail work.

The responsible person will vary depending on the Business and whether the classification is for an existing site or a Project.

On an operating site the responsible person could be, for example, the site Operations Manager who would be responsible for ensuring that classification was complete and updated as required.

On a Project, it could be the Project or Engineering Manager depending on the size. With a Contractor involved, the initial work will normally be carried out by the Contractor, preferably with BP involvement as the classification is developed. Depending on the Project organisation, it may be necessary for both Contractor and BP to appoint a responsible person.

The composition of the team recognises that area classification itself (but not equipment selection) is primarily a process rather than an electrical engineering function.

CHAPTER 2

THE TECHNIQUE OF HAZARDOUS AREA CLASSIFICATION

2.12 The Application of the IP Flashpoint Classification

2.12.3 Class II(1) or III(1)

- (a) The recommendation in the footnote to the first paragraph shall be followed.
- (b) The following shall be added to the third paragraph:

In other locations, the maximum ambient temperature may be assumed to be that temperature which meteorological records show is unlikely to be exceeded for more than 90 hours/year.

For a liquid to be regarded as below the flash point there shall be a gap of at least 8°C between the maximum ambient temperature and the specified minimum flash point of the product.



- (c) The first paragraph shall be replaced by:

A flammable mist can be produced from Class II(1) and Class III(1) liquids and even from unclassified liquids if the release were from a high pressure system through a small diameter orifice. For the purposes of area classification there is no general requirement to classify as hazardous high flash point liquids handled below the flash point. However, it must be appreciated that such liquids can be hazardous under certain conditions.

Within processing areas liquids with flash points below 200°C should normally be considered as hazardous. BP may specify an exception to this if it can be confirmed that the liquid cannot be atomised or raised above the flash point on release.

Outside processing areas, pumps, other than glandless pumps, and piping systems shall be regarded as sources of release when the pump discharge pressure or the piping system operating pressure is 5 bar g or above and the liquid flash point is below 150°C.

Classification of storage tanks should be in accordance with Chapter 3 of IP 15 as amended by this document.

(Substitution for IP 15 2.12.3 first para)

This amendment provides additional information on mist formation and when liquids with flashpoints above ambient temperature shall be considered hazardous. As written, IP 15 would include hydraulic oils as hazardous because they can produce under certain conditions a mist which can be ignited by an ignition source with sufficient energy.

Such conditions are unlikely and there is no indication from operations that classification of hydraulic system is necessary. The tighter requirements for processing areas do take account of the fact that processing areas normally contain hot lines.

The exception should only be made if the area is free of hot lines and the fluid viscosity and operating pressure are such that mist formation is unlikely. Higher viscosity liquids are less likely to form a mist. Conversely, processing them on a plant free from steam lines is abnormal.

The pressure of 5 bar g is probably the minimum required to produce a mist with a low viscosity oil.



CHAPTER 3

THE CLASSIFICATION OF STORAGE TANKAGE, BULK LOADING AND UNLOADING BY ROAD AND RAIL, PETROLEUM JETTIES AND BULK DISTRIBUTION AND MARKETING FACILITIES BY THE METHOD OF DIRECT EXAMPLE

3.1 Scope

3.1.2 Class of Petroleum

* Class II(1) and III(1) liquids should be considered as Class II(2) and III(2) respectively if they receive material direct from a process unit or if the tanks are heated. Any exception to this shall be subject to approval by BP.

(Addition to [IP 15 3.1.2](#))

Material received direct from a process unit can be of a significantly lower flash point than desired because of plant upset or abnormal operation. Any exception to classifying liquids from a process unit as Class II(1) or III(1) should be considered only when :

- (a) *the unit feed is from tankage, tested for flash point before processing*
- (b) *the process is such that the feed flash point cannot be reduced.*

3.2 Storage Tanks (Fixed and Floating Roof) in Open Air Ventilation - Classes I, II(2) and III(2) - General

3.2.1 Fixed Roof Tankage - Classes I, II(2) and III(2)

Where the bund is less than 15 m from the tank then the Zone 2 area shall extend to 15 m from the tank. For tanks of diameter 10m or less, the distance may be reduced to 7.5 m.

Tanks with a nitrogen or fuel gas blanket which do not vent to atmosphere, e.g. venting to an incinerator, may be classified as secondary grade release. The area shown as Zone 1 in Figure 3.1 may be classified as Zone 2.

Fixed roof tanks with a nitrogen blanket and venting to atmosphere shall be classed as a primary grade source of release.

(Addition to [IP 15 3.2.1](#))

This amendment provides guidance for cases not considered in [IP 15](#).



3.3 Road Tanker Loading - Classes I, II(2) and III(2)

3.3.4 The Classification for the Top Loading of Road Tankers - Classes I, II(2) and III(2)

3.3.4.1 Classification of the Gantry - No Vehicle Present

Because of the frequency they should be regarded as a primary grade release. The resulting Zone 1 should extend vertically from the island base to 2 m above the walkway. The horizontal extent should cover the total area of the island and should extend at least 2 m from the loading arm in the parked position. (The dimensions shown in IP 15 Figure 3.6 shall be amended).

(Amendment to IP 15 3.3.4.1 2nd para)

3.4.3 A different situation from that in 3.4.1.....

(correction of typographical error in IP 15 3.4.3)

Figure 3.12 Road Tanker Parked for Unloading - Classes I, II(2) and III(2)

The Zone 2 area shall extend 1m above the loading point. The area around any coupling should be classified as Zone 1 when there is a high frequency of unloading and spilt liquid (small in volume) is likely to be present for more than about 10 hours/year. Classification as Zone 1 should be considered when more than three vehicles a day unload at a specific point.

(Amendment to IP 15 Figure 3.12)

No dimensions for the height are shown on the IP figure.

CHAPTER 4

THE CLASSIFICATION OF DRILLING RIGS AND OTHER EQUIPMENT SYSTEMS USED IN WELL OPERATIONS AND PRODUCTION WELLHEAD AREAS

4.1 Introduction

During drilling and workover within the UK Continental Shelf, the requirement of Section 10 of Department of Energy Guidance (4th Edition) on SI 289 must be complied with.



4.2 Classification for Drilling, Workover and Wireline Operations in Open Areas

4.2.3 Rig Upperworks

Add to the second paragraph:-

With an open area derrick (non enclosed) and an open area substructure it is good practice to classify all of the space within the derrick as Zone 2.

4.2.5 Operations in Situations where the Rig and/or its Wellhead Area are not 'Open'

If the substructure is totally enclosed the internal space shall be classified as Zone 1. There shall be a Zone 2 area extending 7.5 m horizontally, 3 m vertically upwards and down to ground level or for 9 m, whichever is less, from all apertures.

(Substitution for [IP 15](#) 4.2.5 3rd para)

This amendment provides additional guidance related to electrical sources and brings the extent of the hazardous area into line with the other parts of the IP code.

4.5 Surface Mud Systems

4.5.1 See Appendix C2 for Commentary.

4.5.3 The second paragraph shall be replaced with:-

Onshore, it is the preferred practice for mud tanks to be located in an open area. Offshore and in onshore areas with severe weather conditions this can be impracticable. In accordance with Table 6.1 an enclosed area containing mud tanks shall be classified Zone 1 if inadequately ventilated and Zone 2 if adequately ventilated. There shall be a Zone 2 hazardous area extending from all apertures in accordance with Figure 6.7 using a hazard radius of 7.5 m.

A sheltered area containing mud tanks should be classified as Zone 2. The Zone 2 hazardous area shall extend outside any apertures with the extent based on Figure 6.6 assuming a hazard radius of 7.5 m.

The volume within the tank shell above the mud shall be Zone 1 for adequately and inadequately enclosed areas and for sheltered areas.

In enclosed areas, mud tanks are often fitted with local extraction ventilation above the tanks. In such cases the air flow may be sufficient to classify the volume within the tank shell as Zone 2. Typically, this



would require an air flow of 1800 m³/hour/ m² of tank cross-sectional area. Each case should be considered individually.

Drilling mud normally flows between equipment in an open or loosely covered ditch. With a hazardous mud the ditch will be a primary grade source of release and therefore should preferably be in an open area. In this case there shall be a Zone 1 hazardous area extending 3 m horizontally and vertically upwards from the ditch and vertically downwards to a solid floor, or for 9 m, whichever is less.

Again this can be impracticable offshore and in onshore areas with severe weather conditions. The effect of a primary grade source in an enclosed area is considered in Table 6.1. With local extraction ventilation, the ventilation rate can be high enough to prevent the primary grade source influencing the whole module (see Note 6 of Table 6.1).

The local ventilation can be sufficient to classify the area around the ditch as Zone 2. Again each case should be considered individually.

(Substitution for IP 15 4.5.3 2nd para)

This amendment amplifies the guidance in IP 15. It removes anomalies with other parts of the IP code and provides guidance applicable to mud tanks not in an open area, a common offshore situation.

Local extraction ventilation is often fitted to mud tanks in enclosed areas to improve the working environment. With a correctly designed system with a hood the flow of air will almost certainly be sufficient to avoid classifying the volume within the tank as Zone 1.

The rate of vapour production from a non boiling liquid in a tank can be estimated from:-

$$G = 0.343 \frac{P_0}{t} l_1^{0.82} l_2 \text{ m}^3/\text{sec}$$

where P_0 is the liquid vapour pressure in bar abs.

t is tank temperature Kelvin ($^{\circ}\text{C} + 273$).

l_1 and l_2 are the tank length and breadth in m.
(For a circular tank $l_1 = l_2 = \text{diameter}$)

(This equation is derived from Equation 15.2.1 of 'Loss Prevention in the Process Industry' by F.P. Lees)

The required total air rate is $\frac{100 G}{0.25 L} \text{ m}^3/\text{sec}$

where L is the lower flammable limit (% vol.).



4.5.4 Replace the second paragraph with:-

In accordance with Table 6.1 an enclosed area containing shale shakers shall be classified Zone 1 if inadequately ventilated and Zone 2 if adequately ventilated.

There shall be a Zone 2 hazardous area extending from all apertures in accordance with Figure 6.7 using a hazard radius of 7.5 m.

A sheltered area containing shale shakers should be classified as Zone 2. The Zone 2 hazardous area shall extend outside any apertures with the extent based on Figure 6.6. assuming a hazard radius of 7.5 m.

In adequately ventilated and sheltered areas the area in and around the shaker shall be Zone 1 (see Figure 4.6 of [IP 15](#)).

Shale shakers are also often fitted with local extraction ventilation. In such cases the air flow may be sufficient to allow the Zone 1 area to be classified as Zone 2. Each case shall be considered individually.

(Substitution for [IP 15](#) 4.5.4 2nd para)

This amendment provides additional guidance.

The air rate required may be estimated from the information in 4.5.3.

On shale shakers, there can be significant gas release from associated gas which could be the major factor in estimating the air rate required.

4.5.7 Delete. This is covered in the amendments to 4.5.3 and 4.5.4.

(Deletion of [IP 15](#) 4.5.7)

4.7 Other Spaces

Note (a) shall be replaced with:-

- (a) Any enclosures which do not themselves contain a source of release but which fall within and with openings to an external hazardous area. In such a case the internal space should be classified in accordance with Table 6.2 of [IP 15](#). There need be no hazardous area drawn from apertures in the enclosure beyond that covered by the area within which the enclosures lie.

(Substitution for [IP 15](#) 4.7 Note (a))



The amendment corrects an anomaly between Note(a) and Table 6.2.

4.9 Producing Oil and Gas Wells on Land

4.9.3 Pumping Wells

The third paragraph shall be replaced with:-

In the case of a beam pumping well, the stuffing box of the pump shall be considered a secondary source of release, in addition to any vents, drains, valves, flanges and filters/strainers. There shall be a Zone 2 hazardous area extending from the periphery of the pump with a hazard radius of 7.5 m. There shall be a Zone 1 area extending 0.3 m from the stuffing box.

(Substitution for [IP 15](#) 4.9.3 3rd para)

The amendment removes an anomaly between beam pumps and other pumps. All pumps are now classified in a consistent manner.

CHAPTER 5

ALTERNATIVE PROCEDURE FOR CLASSIFICATION OF AN UPSTREAM OR DOWNSTREAM SECTOR FACILITY BY CONSIDERATION OF THE INDIVIDUAL POINT SOURCE

5.1 Scope

Note (c) shall be replaced by :

- (c) The category of fluid drained from process drains and vents which, in normal operation, are closed by a spade, plug or blank and are used only during shutdown should be based on the material at shutdown. Such drains and vents should be regarded as secondary grade sources of release.

(Substitution for [IP 15](#) 5.1 Note (c))

The change means that planned normal operations used only at shutdown are considered in area classification. The shutdown procedures should be planned to avoid the release to atmosphere of quantities larger than those considered in area classification. The clause now agrees with 5.7.6 of [IP 15](#).



5.5 Determination of the Extent of a Hazardous Zone

5.5.5 Procedure to Assess the Dimensions of the Hazard Zone around the Point Source by Hazard Radius/Fluid Capacity

*

The following shall be added after Step 2:-

For open-air process plant BP may specify that the hazard radius be determined by the procedure below, which avoids the need to consider each individual secondary grade source of release.

Any continuous or primary grade sources shall be considered individually, together with sumps and any assessment of the effect of spillage. The local Zone 1 areas around pump seals (see 5.6.5) and valve glands (see 5.10.5) shall be included in the classification.

The hazardous area shall extend from the peripheral equipment containing hazardous fluids, using a hazard radius dependent on the Fluid Category of the fluids in the plant, as shown in the following list:-

Fluid Category A: The hazard radius shall be 15 m, provided that the design includes the following features to avoid release to atmosphere:-

- (a) The use of high integrity pumps on Category A fluid duty.
- (b) The provision of a closed system for process vents, process drains, and level glass drains discharging Category A fluid.

If the design does not include these features, the hazard radius shall be calculated using the point source method.

Fluid Category B: The hazard radius shall be 15 m, provided pumps comply with Clause 5.6.4 as amended by this document and there is a closed system for process and level glass drains with a diameter greater than 12 mm and discharging Category B fluid. For crude oil systems the hazard radius may be reduced to 7.5 m, provided that it does not enclose any pumps on Category B crude oil duty or facilities for draining crude oil direct to atmosphere. Note that for this purpose, condensate shall not be regarded as crude oil.



If pumps do not comply with 5.6.4, the hazard radius shall be 30 m.

Fluid Category C: The hazard radius shall be 7.5 m.

Fluid Category G: The hazard radius shall be 15 m for heavier than air gases, or 5 m for lighter than air gases. Note that lighter than air gases are often confined to a small section of the plant. Each source should be considered individually.

Where fluids in more than one category are present, then the most volatile of the fluids present shall be used as the basis for estimating the extent of the Hazardous Area, i.e. if both Category B and Category C fluids are present, then the classification shall be based on Category B.

(Addition to IP 15 5.5.5)

The hazard radii listed in IP 15 are based on features which result in large radii (30 m). These features should not be found in plant designed to current BP Group Recommended Practices.

On typical open-air plant built to BP Group Recommended Practice, it is possible to simplify the classification procedure because the design features which control the boundaries are standardised. The procedure in 5.5.5 is based on this, and would normally be specified for open-air onshore plant. The use of this method is especially helpful in the early stages of design when the location of equipment features is unknown. This technique can result in a larger Zone 2 Hazardous Area than if each source were considered individually. However, the Zone 2 Hazardous Area is often extended to readily identifiable features, e.g. roads.

5.6 Pumps

This section introduces the concept of enhanced integrity for pumps with some kind of additional seal but not meeting the sealing arrangements required for high integrity.

* 5.6.2 This clause and Table 5.1 shall be replaced by:-

Otherwise, a pump should be regarded as a single point source for the purposes of determining the hazard radius (see Table 5.1). In this Table the terms 'high integrity' and 'enhanced integrity' refer to pumps in which the system design reduces the probability of release, and the likely rate of release.

Glandless pumps and pumps fitted with a double mechanical seal (including a tandem seal) should be considered as high integrity.



Pumps with a single mechanical seal and throttle bush and either a back-up seal or lip seal should be regarded as enhanced integrity, subject to approval by BP.

On high integrity and enhanced integrity pumps, there shall be no operational vents or drains, or other likely release sources for Category A or B fluids direct to atmosphere. A vent or drain to atmosphere which is blanked in normal operation and used only on depressured shut-down equipment should not be regarded as an operational vent or drain.

Pumps in continuously manned areas, with single mechanical seal, throttle bush and either a back-up or lip seal will normally be regarded as having enhanced integrity. On such pumps, the back-up or lip seals should be effective for at least two hours after main seal failure. Warning of main seal failure is therefore required. For pumps in unmanned areas to be considered as having enhanced integrity, there must be sufficient time for operator attendance and action to shut down the pump after warning of main seal failure.

BP Group RP 34-1 recommends seal types for specific applications.

Table 5.1 Pumps

Fluid Category	Hazard	Radius (m)	
	Standard Pump	Enhanced Integrity Pump	High Integrity Pump
A	30 (2)	15 (3)	7.5
B	15 (4)	7.5	3
C	7.5 (1)	3	3

- (1) For clean liquids, e.g. finished petroleum products pumped from atmospheric storage at rates not exceeding 100 m³/hr, the hazard radius may be reduced to 3 m.
- (2) Standard pumps on this duty are no longer acceptable in BP Group [RP 34-1](#).

The radius of 30 m against standard pumps on Fluid Category A duty is given to cover the case where such pumps are existing. Such pumps are not in accordance with BP Group Recommended Practices.

- (3) Enhanced integrity pumps on this duty are not the preferred choice in BP Group [RP 34-1](#).



- (4) Standard pumps on this duty are not the preferred choice in BP Group [RP 34-1](#).

(Substitution for [IP 15 5.6.2](#))

- 5.6.4 Pumps fitted with single mechanical seals and meeting the recommendations of BP Group [RP 34-1](#) will have a throttle bush as minimum additional protection. However, should there be any pumps without a throttle bush, the hazard radius should be increased to at least the distance required at one Fluid Category more severe, e.g. from 7.5 to 15 m, because more fluid would be released in the event of seal failure.

(Substitution for [IP 15 5.6.4](#))

- 5.6.5 Pumps on Category A or B fluid duty with a single mechanical seal and throttle bush are not in accordance with BP Group [RP 34-1](#). On any such pumps there is likely to be some small continuous vapour leak around the seal.

Pumps with packed glands are not recommended for category A or B fluids, and are not normally used for Category C fluids. Should they be used, however, then there is likely to be a continuous weep of liquid or vapour. The packed glands for Category C fluids and single mechanical seals for Category A and B fluids (both regarded as a primary grade source) should have a hazard radius of 0.3 m. This is not intended to govern the type of protection of the motor, but can limit the proximity of instrumentation to the seal. The larger release which would occur if the seal failed is covered by the hazard radius determined from Table 5.1.

(Substitution for [IP 15 5.6.5](#))

5.7 Equipment Drains and Liquid Sample Points

- 5.7.5 5.7.5 (b) shall be deleted.

(Deletion of [IP 15 5.7.5\(b\)](#))

5.9 Instrument and Process Vents to Atmosphere

- 5.9.3 Emergency relief systems to atmosphere should be designed in accordance with BP Group [RP 44-1](#). There shall be a Zone 1 area extending 1.5 m in all directions from the point of discharge.

(Substitution for [IP 15 5.9.3](#))

The small Zone 1 area covers passing relief valves.

- 5.9.4 Add:-



Vents with a discharge velocity above 150 m/s shall be considered in the same way as emergency relief systems.

(Addition to IP 15 5.9.4)

Table 5.4 The final sentence of the note shall be deleted.

(Deletion of IP 15 Table 5.4 Note)

Table 5.5 An additional note shall be added:-

For lighter than air gases, the hazard radius shall be 5 m.

(Addition to IP 15 Table 5.5)

5.10 Piping Systems

5.10.5 See Appendix C3 for Commentary.

5.11 Liquid Pools Due to Spillage

5.11.2 The second and third paragraphs shall be replaced by:-

Table 5.7 is applicable to Category C fluids with a volatility similar to that of motor gasoline. It will normally be applicable to installations and depots handling Class I, II and III petroleum products. For fluids with a significantly higher volatility, the distance D in Table 5.7 shall be doubled.

For gases or Category A and B fluids, the size of the Hazardous Area will normally be determined by the initial vapour release. The size of this Hazardous Area should be estimated using the appropriate section of this Code. Any resultant liquid pool, possibly not adjacent to the original source, shall be considered as a Category C fluid, because any vapour will already have been released. The liquid will however be at a temperature close to or at the boiling point. Therefore, because of the high volatility of the liquid, the distance D obtained from Table 5.7 shall be doubled.

(Substitution for IP 15 5.11.2 2nd & 3rd para)

The amendment provides enhanced safety for spillages of Category A and B fluids.

5.12 Sumps, Interceptors and Separators

5.12.4.1 In the first sentence, D₂ shall be replaced with D₁.

(Amendment to IP 15 5.12.4.1)

The amendment corrects a typographical error.



CHAPTER 6

VARIATION IN VENTILATION CONDITIONS

6.2 The Classification of an 'Open Area'

6.2.4 Abnormal Topographical or Meteorological Limitations

It will normally be impracticable to use fans on an open area plant.

(Addition to IP 15 6.2.4)

Figure 6.3 Hazardous Area from Point Source - Open Area - Release lighter than Air

The table shall be replaced with:-

Hazard Radius (m)	H ₁ (m)	D ₁ (m)	H ₂ (m)
15	15	15	15
5	7.5	5	3
3	5	3	3
1.5	1.5	1.5	1.5

(Substitution for IP 15 Figure 6.3 Table)

6.4 Sheltered Areas

6.4.3 The Area Classification of Sheltered Areas

The paragraphs beginning 'In the assessment of ventilation ... ' and 'Apertures should be distributed ... ' shall be deleted and replaced by :

The location and number of ventilation apertures required depend on the enclosure size, shape and location relative to adjacent enclosures or obstructions. Ventilation shall be assessed by a specialist engineer.

(Substitution in IP 15 6.4.3)

Prediction of natural ventilation of an enclosure is complex. It is not capable of assessment by simple rules for all situations and therefore this practice refers the user to a ventilation specialist.



6.5 Enclosed Areas

6.5.4 Adequate Ventilation of an Enclosed Area

The Note shall be replaced with:-

For adequate ventilation, the ventilation air may be drawn from an area classified as Zone 2 or non hazardous. It shall not be drawn from an area classified as Zone 0 or Zone 1.

(Substitution for [IP 15](#) 6.5.4 Note)

In the context in which 'adequate ventilation' is used, such enclosures will always be classified as hazardous (see Tables 6.1 and 6.2). Hence it is acceptable to use air drawn from a Zone 2 area.

6.5.8 Overpressure Ventilation (Pressurisation)

This is artificial ventilation of an enclosed area so that the enclosed area is maintained at a pressure above atmospheric and at a pressure sufficiently above that of the surrounding area to prevent possible ingress of a flammable atmosphere from an outside source. One use is to maintain as non-hazardous an enclosed area not containing a source of release but located in a hazardous area. In this case the ventilation air shall be taken from an area classified as non-hazardous. It can also be used, in conjunction with adequate ventilation, to maintain an enclosed area containing only secondary grade sources as Zone 2 when surrounded by an area classified as Zone 0 or Zone 1. In this application the ventilation air may be drawn from an area classified as Zone 2 or as non-hazardous. It shall not be drawn from an area classified as Zone 0 or Zone 1.

Where there are adjacent non-hazardous Zone 2 and Zone 1 areas, which it is desired to keep separate by this means, then the pressure in the non-hazardous area must be greater than in the Zone 2 area, which must have a greater pressure than the Zone 1 area.

The pressure differential between the areas should be controlled to at least 2 mm water gauge (50 N/ m²). Warning, preferably both audible and visual, should be provided for a loss of pressure differential. See also actions in the event of ventilation failure in 6.6.3.

If access exists between an external Zone 1 and an overpressure protected non-hazardous area, then an air lock shall be installed to prevent direct connection.



If access exists between Zone 2 and non-hazardous areas then either an air lock in which both doors are not open simultaneously or a locked door shall be installed. The locked door shall be vapour tight and opened only under permit or for escape of personnel.

Because the pressure differential can drop momentarily during use of an air lock, some delay on activation of any shutdown of electric equipment may be considered.

Such a delay following an audible alarm should typically not need to exceed 30 seconds.

(Substitution for [IP 15 6.5.8](#))

IP 15 states that the air for overpressure ventilation must always be drawn from a non-hazardous area. This is not a requirement when the enclosure is classified and the amendment covers the case. The amendment also adds guidance on access between Zone 2 and non-hazardous areas.

Overpressure protection as a form of local artificial ventilation can also be applied direct to the enclosed casing of electrical apparatus in which there is an ignition potential (see [BS 5345](#) Part 5). In such cases air or an inert gas may be used and may serve other purposes also, such as a coolant for motors (see also Table 7.1, Appendix F and the [IP 1 Electrical Safety Code](#), 1990 revision).

(Both pressurisation and continuous dilution permit electrical apparatus of these categories to be installed in hazardous areas where other types of protection are impracticable or uneconomic).

6.6 The Effect of Loss of Ventilation on the Area Classification of an Enclosure

6.6.1 Provisions for Loss of Adequate Ventilation

The sentences beginning 'Equipment not suitable for Zone 1 should ... ' and 'A master switch is normally ... ' shall be deleted.

The following sentence shall be added:

There should also be a written procedure to cover means of restoring ventilation.

(Deletion and Addition to [IP 15 6.6.1](#))

IP 15 recommends isolation of all electrical equipment not suitable for use in Zone 1 on gas detection. Equipment in the enclosure will, by definition, be suitable for use in Zone 2 and therefore suitable for short term use in a flammable atmosphere. Isolation of such equipment could cause problems and each case must be considered individually. It may be less hazardous to allow equipment to run.



6.6.2 Provisions for the Loss of Dilution Ventilation

Dilution ventilation is sometimes used with a permanent ignition source and secondary grade source of release e.g. fuel gas piping within a gas turbine hood. In such a case, release is unlikely and it may be considered preferable to allow the equipment to run and thus avoid the hazards of a total emergency plant shutdown. Action to stop the ignition source shall be taken on detection of flammable gas. (Shutdown may also be required for other reasons, e.g. high temperature due to loss of cooling air). Each case should be considered individually.

(Addition to [IP 15](#) 6.6.2)

6.6.3 Provision for the Loss of Overpressure Ventilation

This isolating switch shall be either certified for use in a Zone 1 area or shall be located within a non-hazardous area which is remote from the area to be isolated.

(Addition to [IP 15](#) 6.6.3)

CHAPTER 7

APPLICATION TO THE SELECTION AND LOCATION OF ELECTRICAL FACILITIES

With the exception of 7.19, this Chapter is not within the scope of BP Group [RP 44-6](#).

(Deletion of [IP 15](#) Chapter 7)

[IP 15](#) Chapter 7 is within the scope of other BP Group Recommended Practices for Engineering, e.g. BP Group [RP 12-1](#) to [12-19](#).

7.19 Battery Rooms

This shall be replaced by:-

It is possible that in addition to petroleum vapours the charging of non-sealed battery cells will lead to the creation of a Hazardous Area since the cells themselves can be a primary source of emission of hydrogen whilst they are 'boost charged'.

Ventilation shall therefore be provided for non-sealed types so that hydrogen concentrations are kept below 0.8% volume. Ventilation air shall be drawn at a level below the cells and discharged at the highest



level in the room. The ventilation system shall be designed to avoid stagnant areas where a hydrocarbon-rich atmosphere could collect. The number of air changes/hr to maintain hydrogen concentration below 0.8% volume is given by the formula:-

$$\frac{1.84 \times \text{charging current (amp)} \times \text{no. of cells}}{35.3 \times \text{room volume m}^3}$$

Charging current in the formula above is the boost charging level.

If mechanical means of ventilation are provided they should incorporate alarm facilities to detect loss of ventilation. If 'in line' outlet fans are utilised they shall be suitable for Zone 1 application. (Apparatus Sub-Group IIc)

(Substitution for [IP 15 7.19](#))

The amendment gives additional guidance on ventilation rates.

In many offshore installations more stringent precautions may be necessary and reference to BP Group [RP 12-1](#) to [12-19](#) should be made for each application.

Further guidance is also contained in [BS 6132](#) and [6133](#).

CHAPTER 8

APPLICATION TO THE CONTROL AND LOCATION OF IGNITION SOURCES OTHER THAN ELECTRICAL

This Chapter is not within the scope of BP Group [RP 44-6](#).

(Deletion of [IP 15](#) Chapter 8)





STANDARD DATA PAGE

FIGURE 1

[illegible]

DEFINITIONS AND ABBREVIATIONS

Definitions

Standardised definitions may be found in the BP Group RPSEs Introductory volume

Abbreviations

API	American Petroleum Institute
CENELEC	European Committee for Electrotechnical Standardisation
IEC	International Electrotechnical Commission
IP	Institute of Petroleum



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.

IEC 79-10	Electrical Apparatus for Explosive Gas Atmospheres Part 10, Classification of Hazardous Areas
API RP 500A	Classification of Areas for Electrical Installations in Petroleum Refineries
API RP 500B	Recommended Practice for Classification of Areas for Electrical Locations at Drilling Rigs and Production Facilities on Land and on Marine Fixed and Mobile Platforms
API RP 500C	Classification of Areas for Electrical Installation at Petroleum and Gas Pipeline Transportation Facilities
BS 5345	<i>Code of Practice for Selection, Installation and Maintenance of Electrical Apparatus for Use in Potentially Explosive Atmospheres (other than mining applications or explosive processing and manufacture) Part 5, Installation and Maintenance Requirements for Electrical Apparatus Protected by pressurization 'p' and by Continuous Dilution, and for Pressurized Rooms</i>
BS 6132	<i>Code of Practice for Safe Operation of Alkaline Secondary Cells and Batteries</i>
BS 6133	<i>Code of Practice for Safe Operation of Lead-Acid Stationary Cells and Batteries</i>
IP Code	Institute of Petroleum Model code of Safe Practice in the Petroleum Industry
IP 1	Part 1 - Electrical Safety Code
IP 15	Part 15 - Area Classification Code for Petroleum Installations, March 1990
SI 289	UK Statutory Instrument No 289
BP Group RP 12	Electrical Systems and Installations (Replaces BP CP 17)
BP Group RP 34-1	Rotating Machinery (Replaces BP CP 10)
BP Group RP 44-1	Overpressure Protection Systems (Replaces BP CP 14)



BP Group [RP 44-5](#) Protection of Plants Handling Flammable Dusts
(Replaces BP CP 38)



SUPPLEMENTARY COMMENTARY

C1 Scope

This Commentary relates to clause 1.1

The primary purpose of this document is the classification of areas to permit the correct selection of electrical equipment. Such equipment should comply with BP Group [RP 12-1](#) to [12-19](#). However, the principles of this document may be used with discretion to guide the location of non electrical ignition sources.

It is applicable to:-

*Refineries
Chemical plants
Terminals
Offshore platforms
Crude oil and gas gathering centres
Drilling facilities
Storage installations
Distribution depots
Drilling facilities
Marketing installations*

It is applicable to new installations, to modifications of existing installations and to any reclassification of existing installations.

It does not cover:-

- 1. The protection of plant handling flammable dusts which is the subject of BP Group [RP 44-5](#).*
- 2. The assessment of any toxic risk in the vicinity of equipment handling petroleum or other flammable fluids.*

General guidance on the main principles, definitions and explanations of terms relating to area classification is included in documents issued by the International Electrotechnical Commission ([IEC 79-10](#)) and by CENELEC. These documents deal with general principles and do not give specific guidance readily applicable to a specific situation or industry. [IP 15](#) follows the general principles of these documents but gives detailed guidance for the petroleum industry.

There are certain sections of [IP 15](#) which require amplification or additional requirements to meet BP practice. This Recommended Practice, BP Group [RP 44-6](#), details these changes.

Codes of practice relating to area classification have been developed by the American Petroleum Institute ([API 500 A/B/C](#)). They tend to be less specific than [IP 15](#) and in particular do not necessarily take account of handling temperature or volatility.

It is believed that facilities classified in accordance with [IP 15](#)/BP Group [RP 44-6](#) will meet the recommendations of [API 500 A/B/C](#).

Many additives or corrosion inhibitors used in process operations are dissolved in a petroleum based fluid, often in the kerosine or gas oil boiling range. The recommended distances can normally be based on the solvent properties.



C2 Surface Mud Systems

This Commentary relates to clause 4.5.1

Oil-based muds are typically an emulsion of oil in water with surface clay added to increase viscosity, and powdered barytes added to increase density. The base oil currently used (November 1988) is a de-aromatised gas oil, BP 83 HF, with a minimum flash point of 95°C.

Theoretically, the fresh oil-based mud is non-hazardous. However, in service the mud can be hazardous for the following reasons:-

- (a) A flammable mist is likely to be produced on release from the high-pressure mud system.*
- (b) The temperature of the mud can be raised in use.*
- (c) The mud will be contaminated with hydrocarbon in drilling through oil-bearing or gas-bearing rock. Hydrocarbon will dissolve in the mud and reduce the flash point. Some hydrocarbon will be removed in the shale shaker and associated inlet ditch, and in any vacuum degasser. However, at the operating conditions of a typical degasser, not all of the dissolved hydrocarbon will be removed. The flash point of the base oil will, therefore, be reduced.*

It is good practice to consider the mud as hazardous in the high-pressure (active mud to the well) system, and also in the low-pressure return system (mud ditch, shale shaker and degasser). Oil-based mud in the active tanks should be regarded as hazardous, with any vents, open hatches or ditches regarded as primary grade sources. To reduce the extent of the Hazardous Area from tanks located within a module, a local artificial ventilation (extraction) system should be used. The maximum extent of the Hazardous Area should be based on Figure 3.1 of [IP 15](#). The local ventilation system should be of high reliability.

The remaining area within the module can be considered as Zone 2. Ventilation failure should be rare and vapour evolution outside the tank, on failure, would be expected to be at a low rate. The more volatile components are likely to be removed in the degasser and also the mud will tend to cool in storage.

Active mud tanks located in the open can be classified in accordance with Figure 3.1 of [IP 15](#).

The area outside fresh mud tanks can be considered Non-Hazardous when using BP 83 HF. Should more volatile oils be used, then it may be necessary to classify the fresh mud tanks as hazardous.

C3 Piping Systems

This Commentary relates to 5.10.5

Some guidance is given below on the type of valves that come under the category of frequently-used valves, with factors that determine whether a valve is more likely to suffer from leakage at the valve stem than normal block valves:-

- 1. Frequent use of both control valves and on-off isolation valves with packed gland stems is likely to be the major cause of leakage. However, ambient and/or process fluid properties and conditions may also contribute to the incidence of leakage, and hence whether an additional primary grade release source with a hazard radius of 0.3 m should be assumed or not.*



2. *Some on-off valves, handling flammable fluids, which are operated routinely, especially where severe conditions apply, would be expected to be in the same leakage category as control valves with packed glands.*

Examples are valves in molecular sieve or pressure swing adsorption processes. Valves in these services are typically operated from, say, only a few times per day to several times per hour, depending on process cycle. In addition these valves are liable to pressure and/or thermal shock. For such cases it is reasonable to expect the valve stem will be more prone to leakage than infrequently-used block valves that remain open or closed during normal operation.

3. *Other valves in less onerous intermittent duties, such as remotely operated isolation valves on blending, tankage and other similar duties, or on protective instrumentation and emergency shutdown valves, are operated less frequently, say, once or less per day. These valves would normally be considered to come into the infrequently-used valve category. The valve stem would thus be considered as a secondary grade of release source, unless operating experience indicates leakage is a problem.*

