



GS 114-9

HVAC - AIR HANDLING UNITS FOR OFFSHORE USE

December 1993

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BP GROUP RECOMMENDED PRACTICES AND SPECIFICATIONS FOR ENGINEERING											
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HVAC - AIR HANDLING UNITS FOR OFFSHORE USE											
APPLICABILITY - Does not preclude adaptation for other applications Regional Applicability: United Kingdom											
SCOPE AND PURPOSE This document specifies the general requirements for the design and construction of HVAC air handling Units for use offshore. Its purpose is for the specification of fit-for -purpose Air Handling Units at minimum cost/											
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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 Guidance for Specification

This Guidance for Specification was developed under the BP Exploration XEU Simple Specifications Initiative. This initiative is intended to simplify the purchasing requirements through a minimum conditions of satisfaction approach in regions where there is a mature supplier resource.

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. 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.

Specification Ready for Application

A Specification (BP Spec 114-9) 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 document specifies the requirements for HVAC Air Handling Units for use on hydrocarbon production, processing and export facilities offshore.

The Vendor's scope shall include the following:-

Air Handling Units complete with casings, support frames, air filters, separators, electric heaters, cooling coils, fans, motors, plenums, access doors and dampers as indicated on the data sheets.

Provision of Documentation

- (a) General Arrangements.
- (b) Wiring and Termination Diagrams
- (c) Noise Spectrum
- (d) Internal Pneumatic Pipework layout

1.2 Quality Assurance

Verification of the vendor's quality system is normally part of the pre-qualification procedure, and is therefore not specified in the core text of this specification. If this is not the case, clauses should be inserted to require the vendor to operate and be prepared to demonstrate the quality system to the purchaser. The quality system should ensure that the technical and QA requirements specified in the enquiry and purchase documents are applied to all materials, equipment and services provided by sub-contractors and to any free issue materials.

Further suggestions may be found in the BP Group RPSEs Introductory Volume

2. GENERAL

2.1 Documentation

- 2.1.1 This Specification shall be read in conjunction with an enquiry or purchase order and the accompanying data sheets.

2.2 Exceptions

- 2.2.1 Tenders for the supply of Air Handling Units shall include either an unqualified affirmation regarding compliance with the specification or a complete list of detailed exceptions.
- 2.2.2 A Vendor may offer alternative suitable proposals where price, delivery or technical advantage may accrue, but such proposals shall be in addition to the main bid/tender.



2.3 Conflicts

- 2.3.1 If any of the reference documents conflict, and definition is not established by the provisions of Section 3 of this Specification, then the Vendor or his sub-supplier shall bring this to the attention of the Purchaser.

3. STANDARD DESIGN REQUIREMENTS

3.1 Design

3.1.1 Air Handling Unit

Air handling units shall house various air moving and processing equipment to supply fresh processed air to the enclosed ventilated spaces. They should be suitable for operating with a positive or negative static air pressure of 3000 Pa, and an air leakage rate as specified in [DW 142](#) for Class B ductwork against this pressure.

The equipment shall be packaged and may include an electric pre-heater/after heater, primary/secondary air filters, cooling coil, air plenums with dampers and single or duplicate air supply fans; where duplicate fans are installed access compartments shall be provided.

The operating duty and unit configuration shall be as detailed in the data sheets.

3.1.2 Filters

Air inlet filters shall remove suspended salt aerosols, dust particles and moisture i.e., drifting rain, snow, mist/fog, sea-water droplets, cement dust, sand blasting dust, burnt hydrocarbons etc.

Primary filtration shall be completed by either disposable coalescer pads or a combination of filter coalescer media with downstream vane inertia separators.

Secondary filtration shall be completed using a dry fabric high efficiency cartridge.

The design and arrestance capability of the filters shall be based around a salt particulate mass size distribution peak of 2 microns.

The Vendor should provide performance characteristics for the 1 to 30 microns range.

Filtration media should be either disposable or washable; refer to data sheets for details.



Under all weather conditions the primary filtration unit shall reduce contaminants above 6 microns at an efficiency in excess of 99% whilst maintaining an air salt concentration below 0.05 ppm kg weight. Efficiency shall be maintained during periods of low humidity.

The design shall ensure that any coalesced moisture cannot be re-entrained into the air stream.

Self draining facilities, to withstand washdown without overflow and back flooding shall be incorporated.

Average air velocities through the filtration media shall be within the selected filter optimum range such that separation, arrestance and holding capacities are not compromised and associated clean and dirty pressure drops are optimised.

3.1.3 Electric Heater Batteries

The Electric Air Heater Batteries shall be suitable for thyristor control and able to withstand thermal shock associated with cold start and system fluctuations.

The Electric Air Heater Batteries shall be of an air tight construction suitable for a maximum operating system static pressure of 1500 Pa.

There may be no upstream filtration hence the air handling units should be suitable for a saline environment.

The air resistance across the coil shall not exceed 100 Pa at the maximum face velocity of 5 m/s.

The heating elements shall be rated for a maximum surface temperature of 150°C.

The reason for limiting the surface temperature to 150°C , instead of 200°C, is to avoid the possibility of ignition when the system shuts down at 60% LEL.

During shutdowns there is a significant heat build up on the electric coils; downrating to 150°C limits the heat build up.

The penalty for this downrating is a slight increase in heater size, however this will not cause installation or maintenance problems.

Two thermal cut-outs shall be provided. The high limit thermocouple shall be set at 200°C, with a manual reset button mounted on either the thyristor control panel or the heater casing facia. The second thermocouple shall be set to 175°C and will be automatically reset.

All thermocouples shall be certified by BASEEFA; refer to data sheets for classification.



3.1.4 Cooling Coils

The cooling coil shall be suitable for a maximum system static pressure of 1500 Pa.

Moisture eliminators shall be provided with each cooling coil.

Whilst the Vendors will state that 2.5 m/s face velocity eliminators are not required, experience has shown that water droplets have formed and caused down stream internal corrosion. The provision of eliminators will have a minimal cost and size impact on the unit.

The maximum face velocity shall be 2.5 m/s with a tubeside cooling water velocity between 0.9 to 1.5 m/s.

Operations must adhere to this water velocity if the internal erosion of the pipework is to be prevented.

External conditions are:

Summer	20°C dry bulb	18°C wet bulb
Winter	-6°C dry bulb	-6°C wet bulb

Seawater temperatures are shown on the data sheets; a 1°C temperature rise from pumps should be allowed for in the design.

The cooling coils shall be designed to incorporate the fouling factor, indicated on the data sheets, without compromising performance.

The seawater will be filtered down to 120 micron and dosed with hypochlorite.

3.1.5 Fans

The Centrifugal Fans shall be suitable for continuous operation at the design duty selected, with an efficiency of at least 75%.

Fans shall be selected to achieve the following rates of air flow at the stated wind speeds.

At 25 m/s (300 Pa) 100% volume flow.
At 44 m/s (930 Pa) 80% volume.

A wind coefficient of 0.8 has been included in the above conversions of wind speed to dynamic pressure.

Fan air discharge velocity shall be a maximum of 15 m/s.

Fan impellers shall be backward curved aerofoil blades.

The reason for this is high efficiency and non-overloading power Characteristics.



Anti-spark and anti-static features should be provided in accordance with [BS 2044](#) and [BS 2050](#) and as indicated on the data sheets.

Fans shall be selected to give a margin for adjustment of +10% performance without reaching critical shaft or impeller speeds.

Fan bearings shall be designed to give operation of 40,000 hours continuously rated.

3.1.6 Dampers

All types of Dampers shall be constructed to withstand and/or close against an internal pressure of 1500 Pa and a duct velocity of 15 m/s.

When in the fully open position, damper pressure loss at an approach velocity of 10 m/s shall not exceed 35 Pa.

When measured with a pressure differential over the closed damper of 2500 Pa, for a 1000 x 1000 damper, the damper air stream leakage rates shall not exceed 0.1 m³/s per m² of damper duct face area.

All remotely operated dampers must open and close within 3 seconds.

3.2 General Construction

3.2.1 Air Handling Unit

Air handling units shall be constructed from pre-insulated composite de-mountable panels secured to a square, hollow or pentapost section framing, and bolted to a rolled steel section support skid which shall be designed for a single lift with integral lifting eyes or removable lifting tubes.

The pre-insulated panels shall have an overall minimum infill thickness of 40 mm. The infill shall be semi-rigid mineral wool having a thermal conductivity not exceeding 0.04 W/m² °C and a minimum density of 80 kg/m³, bonded between the casing of the Air Handling Unit.

The internal flooring of walk-in access sections shall be suitable for maintenance and service operations.

Hinged access doors constructed from similar panels to the rest of the air handling unit should be provided along with heavy duty cam locks.

Where indicated on the Data Sheets, access section shall be provided with a bulkhead light wired in galvanised steel conduit to an externally mounted operating switch.

Where indicated on the Data Sheets, internally located air handling units shall be double skinned, constructed from galvanised steel to [BS 1449](#) Part 1 and [BS 2989](#) with a minimum coating of 276 g/m² protected against corrosion by means of the Vendor's standard paint finish. Both inner and outer skins shall be 1.5 mm thick.



Externally mounted air handling units shall be double skinned. Each skin shall be of stainless steel construction, the inner skin and the outer skin 1.5 mm minimum thickness, all to BS 970 Part 1 grade 316 and BS 1449 Part 2.

Compartments needing personnel access points for routine maintenance shall be provided with handles and lift-off type hinges.

The Air Handling Unit shall have Vendor's standard nameplate containing the following information:

Project Name
P O Number
Vendor's Serial Number
Year of Manufacture
Tag Number
Air Volume m³/s
Air Flow Indication Arrow
Fan Direction Rotation Arrow
Weight Dry kg
Weight Operational kg

In addition the components within the Air Handling Unit skid shall also bear nameplates containing the following information:

Air Filters and Separators

Filter clean resistance Pa
Filter dirty resistance Pa
Tag Number

Electrical Air Heater Batteries

Duty kW
Air Pressure Drop Pa
Electrical supply V/Ph/Hz
Electrical Classification
Tag Number

Cooling Coils

Duty kw
Seawater Flow Rate kgls
Air Pressure Drop
Water Pressure Drop kPa
Tag Number



Fan

Motor Duty kW

Fan Speed rpm

Motor Speed rpm

Motor Classification

Fan Tag Number

Motor Tag Number

3.2.2

Framing

The framing shall be from galvanised steel. Units may be arranged for bolted equipment sections or a built-up frame from the support skid. In either event all equipment contained within the unit shall be readily accessible and easily removable without obstruction by the framing.

Framing shall be provided with panel edge seals fitted with flame retardant gaskets.

The framing shall be internally insulated to the same standard as the panels.

Armaflex is one product that has been found to meet these requirements.

3.2.3

Skid Base

Air handling unit support bases shall be welded, and should form an integral part of the Air Handling Unit (separate demountable support frames shall not be provided). Where dissimilar metals come into contact, suitable insulation materials shall be inserted between the surfaces to prevent electrolytic action.

The support bases shall have adequate strength to transmit equipment loads to the supporting foundations and should be suitable for welding to the main deck structure.

The overall horizontal dimensions of the support base shall not be less than the overall dimensions of the mounted equipment with the primary load carrying members running the full length of the base.

The support base equipment shall be provided with four lift points designed to support the lift weight using an impact factor of 2.0. Lift points shall be positioned and orientated to prevent fouling and to ensure the units remain horizontal.

The Vendor shall, on request from the Purchaser, provide structural calculations and such documentation as required to confirm the integrity and safe handling capability of the lifting arrangement.



3.2.4 Air Filters and Separators

The complete assembly shall be fabricated in stainless steel to [BS 1449](#) Part 2 grade 316L.

Casings shall have a minimum thickness of 3 mm with an air tightness against internal pressure of 1500 Pa.

The filter media shall conform to [BS 476](#) Parts 4 and 7, i.e. shall be inert, non toxic and not support mould growth.

Gasketing, sealing and insulating materials shall conform to the above requirements.

The filter media shall not migrate into the airstream and should be treated to ensure it is not water retaining.

The filter media shall be mounted on a substantial frame, with individual holding sub frames, the design of which shall permit change-out from the preferred face or side. Where side access is required the frame shall be provided with slide rails to facilitate replacement.

The secondary filtration arrangements shall generally be in line with the primary filtration arrangements with the exception of drainage and separator facilities which are not required.

The primary filtration unit shall form an integral part of the unit and access, drain and pressure measuring requirements shall be transferred to the unit casing. The frame and separator shall be held rigidly in place within the unit and the overall construction shall prevent flooding into other compartments.

The internal drainage facilities shall be arranged to prevent pooling.

Provision should be made for a 150 mm water seal on the drain; this should be terminated with a 2" ANSI-B-16.5 150 lbs RF flange.

Access for change-out shall be as indicated on the data sheets.

Sealing strips shall be completed using stainless steel 316L.

Each filter arrangement shall be provided with magnehelic differential pressure gauges for local pressure monitoring.

Each filter arrangement shall be provided with differential pressure tappings for remote indication; tappings should terminate at the casing with 6 mm bulk head fittings.

3.2.5 Electric Air Heater Batteries

Electric elements shall be of the sheathed black heat type, incorporating an 80/20 nickel chrome resistance wire welded to terminal pins and encased in an "Incoloy 800" tube.



This type of material has better qualities for corrosion resistance than stainless steel and has now become the industry standard.

Element tubes should be supported to prevent sagging and arranged for easy withdrawal

The heater batteries should include 110% of the rated number of elements.

Having spare elements increases the availability of the heater and reduces the associated onshore/offshore storage costs.

The casing materials shall be mild steel to [BS 1449](#) Part 1 and hot dipped after manufacture to [BS 729](#) Table 1 and shall be 3 mm thick, or if Vendors standard is stainless steel this will be acceptable. The grade shall be 316L to [BS 1449](#) part 2 and shall be 3 mm thick.

A three phase 440 V power supply should be used for heater batteries with a capacity greater than 2.5 kW.

During manufacture/assembly homogeneous moisture resistant sealing joints shall be provided on metal sheathed mineral insulated electric heating elements.

This ensures electrical continuity of the elements while the heater batteries are in storage or shut down for long periods. Without this treatment moisture will permeate the unit with the possibility of unit failure when it is operated.

3.2.6

Cooling Coils

The header box tube plates shall be 25 mm thick, the cover plates shall be 20 mm thick with the header grids varying from 6 mm to 19 mm. The above shall be manufactured from cupro-nickel 90/10 to [BS 2875](#).

Easy maintenance for cleaning and removal of tubes.

The header grid boxes shall contain baffles to determine the number of water flow passes per cooler.

The secondary tubes shall be manufactured from solid drawn seamless cupro-nickel tube to [BS 2871](#) Part 3. They shall be expanded a minimum of 0.6 mm into fin collars. All secondary tubes shall have a minimum wall thickness of 0.8 mm.

The whole block shall be electro-tinned after manufacture to [BS 1872](#) with a tin thickness of not less than 30 microns.

Using electro-tinning provides better corrosion resistance.

CuNi 70/30 may be offered as an alternative material provided it meets the design life identified on the data sheets.



Fins shall be 0.25 mm thick copper strip to BS 2870 and electro-tinned after manufacture as part of the fin block.

The coil shall be housed in 3 mm mild steel to BS 1449 Part 1 or 3 mm stainless steel to BS 1449 Part 2 type 316.

Header boxes shall be located out of the air stream.

Each coil shall consist of a drain cock, air vent and drip tray.

3.2.7

Fans

Fan casings shall be constructed from continuously welded mild steel plate to BS 1449 Part 1, with a minimum thickness of 3 mm; the casing shall be hot dipped galvanised after manufacture to BS 729 Table 1. Depending on the fan size, fans shall be split horizontally with sections flanged and bolted together.

All fans shall have an access door, drain cock, flanged inlet and outlet connections and an easily removable inlet cone.

Inlet cones are used to reduce pressure loss.

The fan motors shall be mounted outside the fan casing on the skid base with the fans being driven by a multi-belt drive with not less than 2 belts on the drive. Belt tensioning and motor alignment facilities shall be provided.

The complete belt drive guard assembly shall be constructed from mesh. Provision shall be provided for fan and motor speed checks via 50 mm access holes; also a slot shall be provided so that belt tension checks can be made without the removal of fan belt drive guard.

The belt guard shall incorporate a brass anti-spark track as indicated on the data sheet.

The fan impeller shall be painted to the Vendor's standard for off-shore application.

Each fan assembly shall have fully enclosed anti-vibration mountings to provide a minimum of 95% vibration isolation.

Flexible connections shall be provided on inlet and outlet nozzles, complete with mating flanges. The minimum length shall be 200 mm.

A flexible material that has been used successfully in the past is Revertex ANI.

The fan assembly shall include an integral support frame. This frame shall be suitable for lifting and transporting without any permanent deflection. Lifting lugs or eyes shall be provided within the structural support frame.



The fan anti-vibration mounting shall be supplied bolted to the support frame.

An earth boss should be welded to the frame, complete with stud, nuts and shake proof washer.

When indicated on the data sheets speed sensors should be provided. These should be mounted on the fan casing with all termination's completed by the Vendor.

3.2.8

Dampers

(a) General

The complete assembly for externally mounted dampers shall be stainless steel to BS 1449 Part 2 and BS 970 Part 1 grade 316.

Internally mounted dampers are acceptable in mild steel to BS 1449 and hot dipped galvanised after manufacture to BS 729 Table 1.

In general, stainless steel dampers have become the vendor's standard product and it may be found that there are not any cost incentives in using galvanised mild steel for internal dampers.

Damper casings, including flanges and lifting eyes, shall be welded from the same material with a minimum thickness of 3 mm.

Casing to be stiffened so that blades and shafts are kept in proper alignment to prevent chattering or binding on the inside of the casing.

The casing depth for all dampers shall be 300 mm flange to flange.

Dampers shall have a mechanical indicator to indicate the open and closed positions.

All damper locations, hazardous types of junction boxes, micro switches, solenoid valves shall be contained on attached data sheets.

All blades shall be of an aerofoil configuration and constructed on a continuous 19.05 mm (3/4") diameter shaft.

Where dampers are exposed to untreated or contaminated airstreams, as shown on the data sheets, the Vendor shall pay particular attention to the selection of bearings, type and material, to ensure that correct damper operation is maintained.

All dampers shall have top, bottom and side seals to ensure an air tight seal is maintained when the blades are closed.

Blade linkages shall be attached to extended spindles by pinning and arranged for operation on one side of the damper casing only.



Linkage arrangement shall not prevent replacement of bearings.

All damper controls shall be designed for fail safe operation (i.e. close on air or electrical failure)

Remotely operated dampers shall be provided with an earth boss, complete with stud, nuts and a shake-proof washer, welded to the damper casing.

(b) Automatic Shut-Off & Non-Return Dampers

These dampers shall be used on fan discharges as indicated on the data sheets.

The dampers shall be pneumatically operated by a single action spring return actuator fitted with detachable linkage.

Actuators shall be provided with rapid air dumping devices and the actuator piped to a pneumatically operated air valve, a plug operated air valve, and a 3 port electric solenoid valve. Refer to Appendix C for control action of the dampers.

The electrical supply to the solenoid valves shall be 100 V a.c., with the status indication being 24 V d.c. and a rating of 10 W.

All pneumatic components shall be suitable for a pressure range of 4 to 13 barg, with the normal operating pressure being 7.0 to 9.5 barg.

All vent ports shall be fitted with dust excluders. The damper assembly shall be internally wired by the Vendor and terminated at the Vendor's supply junction box. The junction box rating shall be as detailed on data sheets.

The control devices for damper operation shall be provided within a removal enclosure and constructed from 1.6 stainless steel or galvanised mild steel, giving full 180 degrees access to the control assembly.

Each damper shall be provided with a micro switch to provide open and closed status.

On a number of projects, gravity type non-return dampers have been used. Experience has shown that this type of damper is difficult to commission and not very good in operation. Only use pneumatic dampers.



(c) Volume Control Dampers

These dampers are used to provide air volume control and fan equipment isolation.

Each damper shall be provided with a quadrant type blade operator with locking screw wheel. The quadrant device shall be used as a mechanical indicator for damper operating status.

3.3 Microswitches

3.3.1 Where indicated on the Data Sheets dampers shall include two micro switches to indicate the fully open and fully closed status.

3.3.2 Microswitches, which shall be single pole sealed units with gold plated or solid platinum contacts, shall operate on a 24 V d.c. supply. They shall have micrometer adjustment and should operate at less than 5% of the actuator travel.

3.4 Instrument Air Tube and Fittings

3.4.1 Tubing and fittings with the damper package shall be stainless steel to [BS 1449](#) Part 2 quality 316L with twin ferrule fittings in metric sizes 6 mm, 10 mm or 12 mm OD.

3.4.2 The tube and fittings should be suitable for instrument air with a test pressure of 20 barg.

3.4.3 The Vendor to provide A-lock type bulkhead fittings at the damper limits.

3.5 Electric Motors

3.5.1 The Vendors standard fan motors will be acceptable provided they meet the requirements of BP Group [GS 112-3](#) Low Voltage Induction Motors. The motor should be rated and certified in accordance with the requirements shown on the Data Sheets.

BP/Purchaser shall provide the local motor control stations, not the Vendor. This is done for overall standardisation.

3.6 Terminal and Junction Box Enclosures

3.6.1 Terminals and junction boxes shall be rated in accordance with the IP protection indicated on the Data Sheets.



- 3.6.2 The Vendor shall ensure the terminals have been completed and tested at his works, and the enclosures are securely fixed to the skid.
- 3.6.3 All cable glands shall be certified complete with inner and outer seals as detailed on the Data Sheets.
- 3.6.4 All terminal and junction boxes externally mounted shall be designed to shed rain water and prevent the accumulation of standing water on any part of the enclosure.
- 3.7 Drainage**
- 3.7.1 The cooling coil and primary filtration sections of air handling units shall be provided with a built-in, seal welded, pre-insulated stainless steel drip tray and drain. The drain should be connected to an easily accessible deep seal manometric trap.
- 3.7.2 The trap water depth shall be sufficient to ensure that the water seal shall not be blown out or sucked into the air handling unit under any circumstances.
- 3.8 Power Supplies**
- 3.8.1 The following power supplies shall be made available to the Vendors package. The power supply frequencies will be shown on the Data Sheets.
- (a) 440 V three phase, four wire, solidly earthed neutral maximum prospective fault level: 80 kA, rms symmetrical.
- (b) 254 V single phase and neutral, solidly earthed neutral.
- 3.8.2 The systems will be subject to the following steady state tolerances:-
- (a) Voltage $\pm 5\%$
- (b) Frequency $\pm 2\%$
- 3.8.3 In addition, voltage transients of up to $\pm 15\%$ of nominal may be encountered.
- 3.9 Earthing**
- 3.9.1 Earthing shall comply with the IEE Recommendations for the Electrical and Electronic Equipment for Mobile and Fixed Offshore Installations.



- 3.9.2 Where non-metallic enclosures are used, means shall be provided to preserve the electrical continuity of the armouring and/or metallic sheaths of cable.
- 3.9.3 Earthing within the electric air heater batteries/terminal boxes shall be the Vendors responsibility. All enclosures and electrical equipment shall have two earth terminals with continuous paths to earth.
- 3.9.4 All insulated enclosures shall have the necessary metal inserts or continuity strips to provide earth continuity to cable armour braids.
- 3.9.5 An earthing boss should be provided to each heater battery complete with stud, nuts and shake proof washer.

3.10 Electrical Enclosures

- 3.10.1 Electrical terminal boxes and/or enclosures shall be rated in accordance with the IP protection, indicated on the Data Sheets. External boxes and enclosures shall be designed to shed rain water and prevent the accumulation of standing water.
- 3.10.2 Junction and terminal boxes in hazardous areas shall be certified EX 'E' 11BT3; refer to data sheets for junction and terminal box classifications.
- 3.10.3 All termination blocks and wiring shall be tagged and separately identified.
- 3.10.4 Separate junction or terminal boxes shall be provided for a.c., d.c. and, IS circuits. Terminals for intrinsically safe terminals shall be coloured blue.
- 3.10.5 IS junction boxes should be separate boxes clearly marked as such. Each terminal shall be clearly and permanently numbered on the body of the terminal itself.
- 3.10.6 Within enclosures, separately mounted and screened terminal blocks/strips shall be provided for each voltage level. Terminals for three phase supplies shall be phase segregated by the installation of barriers. All a.c. terminals over 55 V shall be shrouded and fitted with hazard warning labels.
- 3.10.7 The Vendor shall route cables so that the direction of entry into the Vendor's terminal boxes and equipment is side or bottom entry.



- 3.10.8 The Vendor shall provide separate gland plates for the glanding of Purchaser's cables and, where compatible with the appropriate standards and Hazardous Area Certification, the gland plates shall be removable and undrilled.
- 3.10.9 Not more than one conductor shall be connected per terminal.
- 3.10.10 The junction boxes provided shall be adequately rated and sized to accept the external cabling specified. Terminals shall either be of the pressure clamp or bolted lug type. Pinch screw terminals, where the screw bears directly onto the conductor, are not acceptable.
- 3.10.11 All control signals from motor starters, contactors and the package units, for starting or stopping the heaters, indicating lamps etc., shall be by volt-free contacts with a minimum rating of 110 V 1A, non-inductive unless specified otherwise.
- 3.10.12 The Vendor shall ensure the terminals have been completed and tested at his works, with the enclosures securely fixed to the skid.
- 3.10.13 All cable glands shall be certified complete with inner and outer seals, as detailed on the Data Sheets.

3.11 Transportation and Inspection

The Vendor shall ensure all Air Handling Units are protected with plywood on the sides, top and ends of the unit. The base frame shall remain exposed so that the unit can be directly located at the final position when delivered to site/yard.

All pipework and ductwork connections shall protrude 150 mm past the plywood protection and be capped. The Vendor shall mark on the plywood casing all locations of terminal boxes, junction boxes, fan motors and the like.

*

The Vendor will, prior to delivery of HVAC Air Handling Units make arrangements for client or client representative inspection of the various components within the HVAC Air Handling Unit assembly prior to the installation of the plywood protective casing.



DEFINITIONS AND ABBREVIATIONS

Definitions

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

Abbreviations

BASEEFA	British Approvals Service for Electrical Equipment in Flammable Atmospheres
IEC	International Electrotechnical Commission
IEE	Institution of Electrical Engineers



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 Standards

- | | |
|-------------------------|--|
| IEC 79 | Electrical Apparatus for explosive gas atmosphere. |
| IEC 529 | Classification of degrees of protection provided by enclosures |

British Standards

- | | |
|-------------------------|--|
| BS 476 | Fire tests on building materials and structures: Part 4, Part 7. |
| BS 729 | Specification for hot dipped galvanised coatings on iron and steel articles. |
| BS 848 | Fans for general purposes Part 1 and Part 2. |
| BS 970 | Specification for wrought steels for mechanical and allied engineering purposes Part 1 grade 316L. |
| BS 1224 | Electroplated Coatings of Nickel and Chromium. |
| BS 1449 | Steel Plate Sheet and Strip: Part 1 and Part 2. |
| BS 1486 | Lubricating Nipples and adapters for use on machinery and vehicles: Part 1. |
| BS 2044 | Determination of resistivity of conductive and antistatic plastics and rubbers. |
| BS 2050 | Specification for electrical resistance of conducting and antistatic products made from flexible polymeric material. |
| BS 2870 | Specification for rolled copper and copper alloys sheet, strip and foil. |
| BS 2871 | Copper and copper alloys, Part 3: Tubes for heat exchangers. |



BS 2875	Specification for copper and copper alloys. Plate.
BS 2989	Specification for continuously hot dip zinc coated and iron-zinc alloy coated steel flat products: tolerances on dimensions and shape.
BS 3790	Specification for endless wedge belt drivers and endless V-belt drives.
BS 4675	Mechanical vibration in rotating machinery: Part 1.
BS 4683	Specification of Electrical Apparatus for Explosive Atmospheres: Part 1 and Part 2.
BS 5265	Mechanical balancing of rotating bodies Part 2.
BS EN 60947-1	Specification for low-voltage switchgear and controlgear.
BS 5501	Electrical Apparatus for Potentially Explosive Atmospheres: Part 5: 1977; Part 6: 1977; Part 7: 1977; Part 9: 1982
BS 6540	Air Filters used in Air Conditioning and General Ventilation: Part 1.
BS 6861	Balance quality requirements of rigid rotors: Part 1.
DW 142	Specification for sheet metal Ductwork.

BP Group Documents

BP Group [GS 112-3](#) Low Voltage Induction Motors
(replaces BP Std 221)

Other Documents

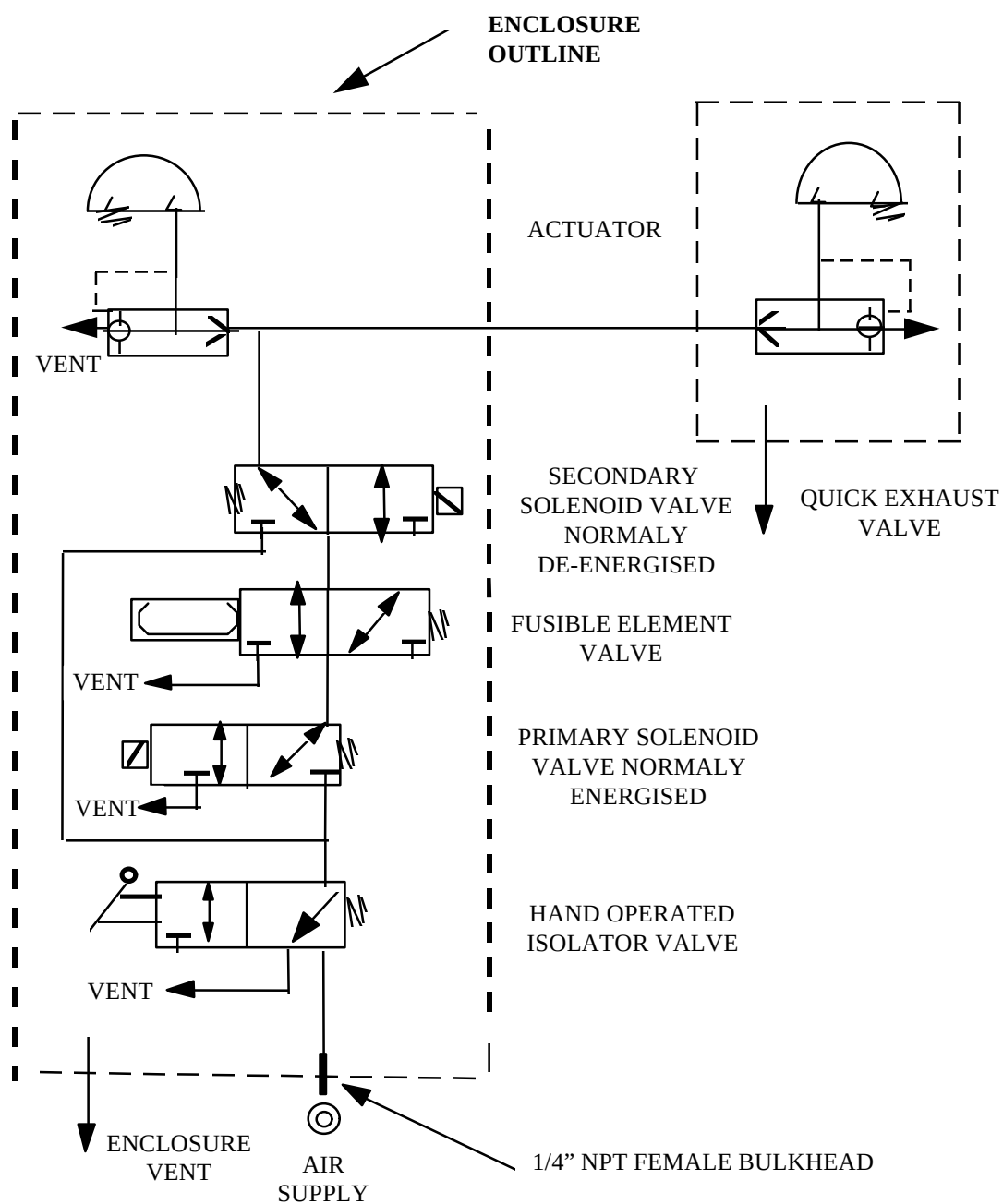
The Institution of Electrical Engineers (IEE)

[Recommendations for the Electrical and Electronic Equipment for Mobile and Fixed Offshore Installations. IEE Regulations - 15th Edition.](#)

[Institute of Petroleum \(IP\); IP Model Code of Safe Practice Parts 1 and 8.](#)



CONTROLS AND PNEUMATIC PIPEWORK ARRANGEMENT



DATA SHEET

SPS-X-XX-XX-HV-0010

Air Handling Units

PROJECT		MODULE/AREA/LOCATION		DOC REF No.							
CONTRACTOR		FLOW DRG No.								REV	
SYSTEM AND SERVICE		LAYOUT DRG No.								REV	
EQUIPMENT TAG NO.										REV	
TECHNICAL DETAILS		UNITS		DESIGN				VENDOR			
1	Air Volume	m ³ /s									
2	Pressure Drop Across Unit	Pa m									
3	Pressure Drop External to Unit	Pa									
4	Size	mm									
5	Inlet Size	mm									
6	Discharge Size	mm									
7	Weight	Kg									
8	Operating Pressure	Pa									
9	Leakage Rate	L/S									
10	MATERIALS CONSTRUCTION							VENDOR			
11	Casing										
12	Thickness Inner Skin	mm									
13	Thickness Outer Skin	mm									
14	Thickness Insulation	mm									
15	Size of Steel Work Base Frame	mm									
16	Provision of Bulkhead Lights										
	Fan Section										
	Filter Section										
17	Accompanying Data Sheets										
	Fan			Yes		No					
	Cooling Coil			Yes		No					
	Heating Coil			Yes		No					
	Humidifier			Yes		No					
	Filter Separator			Yes		No					
18	Sound Spectrum 10 ⁻¹² W	63 Hz	125 Hz	250	500 Hz	1K	2K	4K	8K		
19											

