



GS 114-2

HVAC - MIXED FLOW FANS FOR OFFSHORE USE

December 1993

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BP GROUP RECOMMENDED PRACTICES AND SPECIFICATIONS FOR ENGINEERING											
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Document Title											
HVAC - MIXED FLOW FANS FOR OFFSHORE USE											
APPLICABILITY - Does not preclude adaption for other applications Regional Applicability: United Kingdom											
SCOPE AND PURPOSE This document gives specification guidance on offshore installation, application, manufacture and testing requirements for HVAC Mixed Flow Fans. Its purpose is for the specification to provide fit-for-purpose HVAC Mixed Flow Fans at minimum cost.											
AMENDMENTS <table border="0"> <thead> <tr> <th align="left">Amd</th> <th align="left">Date</th> <th align="left">Page(s)</th> <th align="left">Description</th> </tr> </thead> <tbody> <tr> <td colspan="4"> </td> </tr> </tbody> </table>				Amd	Date	Page(s)	Description				
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FOREWORD

Introduction to BP Group Recommended Practices and Specifications for Engineering

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

Value of this 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.

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 Group GS 114-2) 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 Mixed Flow Fans for use on hydrocarbon production, processing and export facilities offshore.

The Vendors scope shall include the following:-

Mixed Flow Fans complete with casing, motors, support frames, drives, anti-vibration mountings, instrumentation and flexible connections as indicated on the attached Data Sheets.

Provision of Documentation:-

- (a) General Arrangements.
- (b) Wiring and Termination Diagrams.
- (c) Noise Spectrum for each fan.

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 Mixed Flow Fans 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 The Mixed Flow Fans shall be suitable for continuous operation at the design duty selected, with an efficiency of at least 60%.

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

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

At 44 m/s (930Pa) 80% volume.

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

- 3.1.3 The maximum air discharge velocity shall be 20 m/s.

- 3.1.4 Mixed Flow fans shall be belt driven, inline, cylindrical casing type with motor mounted external to air stream and suitable for either horizontal or vertical mounting.

- 3.1.5 Fan impellers shall be of a mixed flow design with non-overloading, non-stall characteristics with air flow at right angles to the direction of rotation.

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

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

- 3.1.8 Fan bearings shall be designed to give operation of 30,000 hours continuously rated.

3.2 General Construction

- 3.2.1 Casing shall be constructed from fully welded rolled tubular mild steel to [BS 1449](#) Part 1 with integral flanges rolled at each end for connection to the ductwork.



3.2.2 Fan casing thicknesses shall be as follows:

300 mm to 400 mm diameter	5 mm
500 mm to 800 mm diameter	6 mm
1000 mm and above	8 mm

Thicknesses are metal only, excludes coatings.

3.2.3 Fan casings shall be hot dipped galvanised after manufacture to [BS 729](#) Table 1.

3.2.3 Access doors shall only be provided on fans greater than 400 mm diameter, these should be air tight and of bolted construction.

3.2.4 The impeller shall be constructed from mild steel to [BS 1449](#) Part 1 and painted to the Vendors standard for offshore applications.

3.2.5 Brass rubbing strip for fans 600 mm and above, smaller fan sizes shall have brass fairings as detailed in the data sheet.

3.2.6 Lubrication points shall be provided external to the fan assembly.

3.2.7 Belt tensioning and motor alignment features shall be provided.

3.2.8 Drive guards manufactured from stainless steel grade 316L complete with brass anti-spark track and removable inspection covers.

The use of ST/ST grade 316L is generally the Vendors standard and HSE require the belt guards to be enclosed. This is the normal standard provided on Mixed Flow Fans.

3.2.9 Flexible connections shall be complete with mating flanges to fans and duct work. The minimum length shall be 200 mm.

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

3.2.10 Anti-vibration mountings shall be totally enclosed and provide a minimum of 95% vibration isolation.

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

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



- 3.2.13 Provision shall be made on the outside of the fan casing to monitor the fan bearings from a hand held shock pulse meter. Fan sizes up to 400 mm shall be fitted with tuned rods. Fans greater than or equal to 500 mm shall have flame proof transducers fitted to each bearing block with termination's on the fan casing.

The meter shall operate when the fans are in the run mode.

Reference shall be made to the data sheets for the provision, rating and classification.

- 3.2.14 When indicated on the data sheets the rotational speed of the fans shall be determined using a speed sensor which should be fixed and mounted on the fan casing. The Vendor shall complete and terminate all necessary wiring.

This is done for confirmation of operation and to initiate automatic changeover to standby motors or fan sets in the event of duty failure.

- 3.2.15 All fans shall have Vendors standard nameplates containing the following information:-

Project Name
P O Number
Vendors Serial Number
Year of Manufacture
Tag Number
Duty m³/s
Motor Duty kW
Fan Speed RPM
Motor Speed RPM
Weight kg
Fan Size and Type

3.3 Electric Motors

- 3.3.1 The Vendors standard fan motors will be acceptable provided they meet with 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 provide the local motor control stations, not the Vendor. This is done for overall standardisation.

3.4 Terminal and Junction Box Enclosures.

- 3.4.1 Terminals and junction boxes shall be rated in accordance with the protection indicated on the data sheets.



- 3.4.2 The Vendor shall ensure that the terminals have been completed and tested, and the enclosures are securely fixed to the skid.
- 3.4.3 All terminals 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.
- 3.4.4 All cable glands shall be certified complete with inner and outer seals as detailed on the Data Sheets.



DEFINITIONS AND ABBREVIATIONS

Definitions

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

Abbreviations

IEC International Electrotechnical Commission



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	Electric Apparatus for explosive gas atmospheres
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 - Part 2
BS 1449	Steel plate, sheet and strip: Part 1 - Part 2
BS 1486	Lubricating nipples and adaptors for use on machinery and vehicles: Part 1
BS 2044	Determination of resistivity of conductive and anti-static plastics and rubbers.
BS 2050	Specification for electrical resistance of conducting and anti-static products made from flexible polymeric material.
BS 3790	Specification for endless wedge belt drivers and endless V-belt drives.
BS 4675	Mechanical vibration in rotating machinery: Part 1
BS 5265	Mechanical balancing of rotating bodies
BS EN 60947-1	Specification for low-voltage switchgear and controlgear



BP Group Documents

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



DATA SHEET

SPS-X-XX-XX-HV-0003

Mixed Flow Fans

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	Fan System Total Pressure	Pa									
3	Fan Speed	RPM									
4	Motor Speed	RPM									
5	Motor Power - absorbed	amps									
6	Motor Power - rated	Kw									
7	Area Classification	-									
8	Motor Rating	IP									
9	Power Supply	V-Ph-Hz									
10	Control Supply	V-Ph-Hz									
11	Fan Diameter	mm									
12	Overall Length	mm									
13	Mounting Arrangement	-		H		V					
14	Speed Sensor	-		Yes		No					
15	Anti Static Features	-		Yes		No					
16	Bearing Monitors	-		Yes		No					
17	Weight of Assembly	Kg									
18	MATERIALS CONSTRUCTION							VENDOR			
19	Casing	-									
20	Grade	-									
21	Thickness	mm									
22	Material of Name Plate	-									
23	Length of Flexible Connection	mm									
24	of Anti-vibration Mounting	-									
25	Size of Earthling Boss	mm									
26	Manufacture of Junction Box	-									
27	Manufacture of Terminal Box	-									
29	Sound Spectrum 10 ⁻¹² W	63Hz	125Hz	250Hz	500Hz	1K	2K	4K	8K		
Motor Position Viewed in direction of Air Flow Accessories Position Viewed in direction of Airflow											

