MATERIAL AND EQUIPMENT STANDARD

FOR

GENERAL PURPOSE CENTRIFUGAL FANS

ORIGINAL EDITION

DEC. 1994

This standard specification is reviewed and updated by the relevant technical committee on Mar. 2011. The approved modifications are included in the present issue of IPS.

FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS are based on internationally acceptable standards and include selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein.

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

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GENERAL DEFINITIONS

Throughout this Standard the following definitions shall apply.

COMPANY :

Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER :

Means the “Company" where this standard is a part of direct purchaser order by the “Company”, and the “Contractor” where this Standard is a part of contract document.

VENDOR AND SUPPLIER:

Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:

Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR :

Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR :

The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

SHALL:

Is used where a provision is mandatory.

SHOULD:

Is used where a provision is advisory only.

WILL:

Is normally used in connection with the action by the “Company” rather than by a contractor, supplier or vendor.

MAY:

Is used where a provision is completely discretionary.

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0. INTRODUCTION

This Specification gives the amendment and supplement to API Standard 673, second edition, January 2002, reaffirmed November 2010:

" Centrifugal Fans for Petroleum chemical and Gas industry services ".

It shall be used in conjunction with data/requisition sheets for centrifugal fans.

For ease of reference, the clause or section numbering of API Std. 673 has been used throughout of this specification.

Clauses in API Std. 673 not mentioned remain unaltered.

For the purpose of this specification, the following definitions shall hold:

Sub. (Substitution)	**:** The API Std. Clause is deleted and replaced by the new clause.
Del. (Deletion)	**:** The API Std. Clause is deleted without any replacement.
Add. (Addition)	**:** A new clause or section with a new number is added.
Mod. (Modification)	**:** Part of the API Std. Clause is modified, and/or a new description and/or statement is added to that clause.

1. GENERAL

1.1 Scope

This standard contains the minimum requirements for centrifugal pumps for use in refinery services, chemical, gas, petrochemical plants and where applicable, in exploration, and production.

Compliance with the provisions of this standard does not relieve the vendor of his responsibility of furnishing centrifugal pump of proper design, mechanically suited to meet operating guarantees at the specified service conditions. No deviations or exceptions from this standard shall be permitted, without explicit approval of the Company.

Intended deviations shall be separately listed by the vendor, supported by reasons thereof and submitted for the Company's consideration. **(Mod)**

Note:

This standard specification is reviewed and updated by the relevant technical committee on Mar. 2011. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No 337 on Mar. 2011. These modifications are included in the present issue of IPS.

1.3 Conflicting Requirements

In the case of conflict between documents relating to the inquiry or purchase order, the following priority of documents shall apply.

- **First priority :** Purchase order and variation thereto
- **Second priority:** Data sheets and drawings
- **Third priority :** This Standard **(Sub.)**

1.5 Referenced Publications

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies. **(Mod.)**

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-M-EL-132	“Material and Equipment Standard for Medium and High Voltage Induction Motors”
IPS-M-IN-280	“Material Standard for Miscellaneous Instrumentation”
IPS-G-PM-260	“General Standard for Gas Turbines for Petroleum, Chemical and Gas Industry Services”
IPS-M-PM-300	“Material and Equipment Standard for Special Purpose Gear Units”
IPS-M-PM-320	“Material and Equipment Standard for Lubrication, Shaft Sealing and Control Oil Systems and Auxiliaries for Process Services”
IPS-M-PM-240	“Material and Equipment Standard for General Purpose Steam Turbines”

IPS-G-SF-900 "General Standard for Noise and Vibration Control"

1.6 Units

This standard is based on International System of Units (SI), as per IPS-E-GN-100 except where otherwise specified. **(Mod.)**

2. BASIC DESIGN

2.1 General

2.1.4 Fan Vendor shall submit noise emission data for the quoted machine as per IPS-G-SF-900. **(Mod.)**

2.1.4.1 Unless otherwise specified, the following limits Shall be met at any measuring location 1m from the equipment surface:
For a two component train-Fan + driver sound pressure limit in dB re 20µ pa
Fan 87 dB(A)
Fan + driver 90 dB(A)
For a three component train- Fan + gear + driver
Fan 85 dB(A)
Fan + driver 90 dB(A)
If the above equipment produces impulsive and/or narrow band noise, the above limits Shall be taken 5 dB (A) lower.

Noise levels shall have an upper tolerance of + 0 dB. The above requirements apply in the absence of reverberation and back ground noise from other sources and for all operating conditions between minimum flow and rated flow. **(Add)**

2.1.4.2 Noise control measures shall cause neither hindrance to operation nor any obstruction to routine maintenance activities. **(Add)**

2.1.13 Unless otherwise specified, fans and auxiliaries shall be suitable for outdoor installation in the climatic zone specified. **(Mod.)**

2.1.23 Fan vendor shall assume unit responsibility for the entire machinery system consisting of fan, driver, power transmission and associated auxiliary equipment. This includes but not limited to engineering responsibility for:

a) Torsional analysis

b) Selection and rating of power transmition components

c) Lube Oil system design

d) Equipment layout

Fan vendor shall resolve all engineering questions relating to the equipment design. **(Add.)**

2.2 Fan Housing

2.2.2 Access doors shall be provided in the following locations:

a) In the fan housing permitting access to the impeller.

b) Adjacent to the inlet guide vanes. **(Mod.)**

2.2.7 Internal bolting, if used within the fan housing, shall be self-locking. **(Add.)**

2.3 Fan Housing Connections

2.3.1 Unless otherwise specified, drain connections shall be valved. **(Mod.)**

2.5 Rotating Element

2.5.8 Impeller overhung designs shall have provisions for supporting the rotor during bearing maintenance. **(Add.)**

2.6 Shaft Sealing of Fans

2.6.6 Induced draft fans operating in hot gas service shall be provided with a deflector plate between the shaft seal and bearing housing to deflect hot gas leakage away from the bearing housing. **(Add.)**

2.9 Lubrication

2.9.5 As minimum, Pressure Lubrication system shall be accordance to IPS-M-PM-320. **(Mod.)**

2.9.5.6 Lubricating oil pressure shall be higher than cooling water pressure at oil coolers, to prevent contamination of oil in case of cooler failure. **(Mod.)**

2.10 Materials

2.10.1 General

3. ACCESSORIES

3.1 Drivers

3.1.4 Electrical Motors shall conform to IPS-M-EL-132. **(Mod.)**

3.1.7 Steam turbine shall conform to IPS-M-PM-240. **(Mod.)**

3.1.8 Gas turbine shall conform to IPS-M-PM-260. **(Mod.)**

3.1.9 Gear shall conform to IPS-M-PM-300. **(Mod.)**

3.2 Couplings and Guards

3.2.1 Couplings between the fan, driver, and gear unit shall be forged steel, non lubricated, flexible couplings. Removable-type coupling guards shall be furnished and mounted. **(Mod.)**

3.2.3 The total coupling end float shall be 6 mm maximum and the total motor end float shall exceed the coupling end float by 6 mm minimum. The motor running center shall not exceed 2 mm from the geometric center of the motor rotor float, and shall be assumed to be at the float center for layout and insulation purposes. **(Mod.)**

3.3.1 Belt Drives are acceptable for driver power under 150 Kw if specified by owner. **(Mod)**

3.4.2 Baseplates

3.4.2.1 **a)** Driver and gear combinations shall be mounted on a common baseplates.

b) The baseplate beneath gear units shall have all structural members extended to the bottom of the main baseplate members. **(Mod.)**

3.4.2.8 During Lifting, the beem deflection of the base plate shall be less than 1/1200 of the total length. **(Add)**

3.5 Controls and Instrumentation

3.5.1 General

3.5.1.1 Instrumentation and installation, including any panels shall conform to IPS-M-IN-280. **(Mod.)**

3.5.2.4 All controls, instrumentation and enclosures shall be suitable for the specified area classification and environmental exposure. **(Mod.)**

3.5.1.4 The automatic starting controls for auxiliary lube oil pumps and all protective systems except overspeed trips shall be designed to permit testing during fan operation. **(Add.)**

3.5.1.5 Alarm circuits shall be "normally energized" and protective system circuits shall be "normally de-energized" when the fan is in operation. Contacts shall open to alarm. **(Add.)**

3.5.1.6 Solenoid operated Valves shall be used only in clean, dry instrument air service. If required for other services the solenoid valve shall act as a pilot valve of pneumatic, hydraulic valves etc. solenoid Valves shall not be used in continuous services such as starting or emergency controls **(Add.)**

3.5.2 Control systems

Note: The control signal range shall be 20 to 100 kPa for pneumatic instruments and 4 to 20 mA for electronic instruments. **(Add.)**

3.5.3.6 Automatically controlled guide vanes shall be either pneumatic or hydraulic type. **(Add.)**

3.5.3.7 If a hydraulic type operating for automatically controlled guide vanes is used and a pressurized lubrication system is provided the source of oil for the hydraulic operation shall be the fan lube oil system. **(Add.)**

3.5.3 Dampers and inlet guide vanes

3.5.3.1 If a louvered damper is specified:

a) Variable inlet guide vanes shall be furnished with permanently lubricated ball or spherical bearings at each spindle support. Vanes shall have any undercut of fillets.

b) Manual operation of the damper from grade level is required. **(Mod.)**

3.4.3.6 For a parallel fan operation each fan shall be provided with an outlet guillotine shutoff gate or louvered damper with a spectacle blind, as specified. **(Add.)**

3.6 Piping

3.7.1 All construction materials for inlet trash screens and rain hoods shall be stainless steel. **(Mod.)**

3.9 Insulation and jacketing

3.9.2 If insulation for personnel protection is specified, the insulation surface temperature shall be no greater than 65°C. **(Mod.)**

3.10 Turning Gear

3.10.2 For fans with pressurized lube system, the turning device shall be designed so that it cannot be engaged unless lube oil pressure is established. **(Mod.)**

3.10.3 The turning gear shall be driven by an electric motor unless noted otherwise. **(Mod.)**

4. INSPECTION, TESTING, AND PREPARATION FOR SHIPMENT

4.1 General

4.1.1 All fans and gear units shall be inspected by the Company's representative. **(Mod.)**

4.1.2 All mechanical run tests, and performance tests when required shall be witnessed. **(Mod.)**

4.3 Testing

4.3.3.1a: Fan shall be operated from 0 to 110 percent of rated speed for turbine drives and at 100% of rated speed of motor drives, with an uninterrupted minimum period of four hours at these maximum speeds, to check bearing performance and vibration. **(Mod.)**

4.3.3.1c: The vendor shall maintain a log of all final tests including vibration and bearing Oil temperature data. Shaft vibration measurements shall be recorded throughout the specified speed range. **(Mod.)**

4.3.3.1e: operation and function of instrumentation and controls shall be demonstrated to the inspector to the extent practical. **(Add.)**

4.3.3.1 f: For fans with turbine drives, the fan rotor shall be subjected to an over speed test of at least 110% of maximum continuous speed during 3 minutes. After the over speed test each impeller shall be check for cracks (by means of the dye penetrant method) and for deformation or other defects. After this inspection fan rotors shall be rebalanced dynamically. **(Add.)**

4.4 Preparation for Shipment

4.4.1 Unless otherwise specified, the rust preventive applied to unpainted machined surfaces shall be of a type:

1) to provide protection during outdoor storage for a period of twelve months exposed to a normal industrial environment, and,

2) to be removable with mineral spirits or any standard solvent. **(Mod.)**

4.4.3.9 Separate partial shipment of materials is not accepted. **(Mod.)**

6. GUARANTEE AND WARRANTY **(Add.)**

6.1 Mechanical

Unless exception is recorded by the Vendor in his proposal, it shall be understood that the Vendor agrees to the following guarantees and warranties

a) All equipment and component parts shall be warranted by the vendor against defected materials, design and workmanship for 1 years after start-up or 18 months after shipment, whichever is longer.

b) If any mal-performance or defects occur during the guarantee and warranty period, the vendor shall make all necessary alterations, repairs and replacements free of charge, with no field labor charges, on the purchaser's job site. **(Add)**

6.2 Performance

The pump shall be guaranteed for satisfactory performance at all operating conditions specified on the data sheet. **(Add)**

APPENDICES

APPENDIX A
TYPICAL DATA SHEETS

Unless otherwise specified, SI Unit data sheets shall be used. **(Mod.)**