ANDREW YULE & COMPANY LIMITED
(A Government of India Enterprise)
Engineering Division, Kalyani Works
Plot -16 A & B, Block-D,
Kalyani, Nadia, PIN-741235, WB

TENDER DOCUMENTS FOR SUPPLY OF 1050KW , 6.6 KV, FOOT MOUNTED FLAME PROOF MOTOR & SUPERVISION OF INSTALLATION & COMMISSIONING.

ANDREW YULE & CO. LTD. invites e-Tender under single stage two part system (Part I: Techno-Commercial Bid and Part II: Price Bid) from bona fide and reputed Company/OEM for above mentioned Job. The Item details are available in **Annexure- i** of this tender document.

Tender document may be downloaded from MSTC website: www.mstcecommerce.com/eprochome/aycl. Corrigenda or clarifications, if any, shall be hosted on the above mentioned websites only. AYCL reserves the right to accept or reject any tender.

Brief Description:-

SUPPLY OF 1050KW , 6.6 KV, FOOT MOUNTED FLAME PROOF MOTOR & MANDATORY SPARES.

Price quoted should be FOR Kalyani Works.

Schedule of Tender

1.	**TENDER NO.**	**AYCL/ENGG/MSD/SSG/HV Motor/18** **Dated: 23/10/2017**
2.	**MODE OF TENDER**	e-Procurement System Online submission of **Part I** - **Techno-Commercial Bid** and **Part II - Price Bid** through www.mstcecommerce.com/eprochome/aycl The intending bidders are required to submit their offer electronically through this e-tendering portal. **No physical tender is acceptable by AYCL/MSTC**
4.	**Date of publication of e-Tender through publication MSTC/AYCL websites and Central Public Procurement Portal**	**24.10.17**
5.	**Date of availability of NIT to the Vendors for downloading**	**24.10.17**
6.	**Earnest Money Deposit**	• **"Earnest Money Deposit"-** as per EMD clause given in the Tender documents. • **Value Rs 50,000**
7	**Tender Fee**	• **Tender Fee – Rs. 1,000/- (One Thousand only))** to be paid by D.D. favoring **Andrew Yule &Co Ltd**, payable at **Kolkata**.
8	**Date of Starting of e-Tender for submission of Online Techno-Commercial Bid and Price Bid at www.mstcecommerce.com/eprochome/aycl**	**24.10.2017 – 4:30 PM**
9	**Date of closing of Online e-tender for submission of Techno-Commercial Bid & Price Bid at www.mstcecommerce.com/eprochome/aycl**	**07.11.17 – 02:00 PM**
10.	**Date & time of opening of Part-I (Techno-Commercial Bid)**	**07.11.2017 – 03:00 PM**
11	**Date & time of opening of Part-II (Price Bid)**	**TO BE INTIMATED LATER ON**

Important Instructions for E-procurement

This is an e-procurement event of ANDREW YULE & COMPANY LTD Ltd.

You are requested to read the Terms & Conditions (Annexure- III, and IV) **of this tender before submitting your online tender. Tenderers who do not comply with the Conditions with documentary proof (wherever required) will not qualify in the Tender for opening of Price Bid.**

1. Process of E-tender:

A) **Registration:** The process involves vendor's registration with MSTC e-procurement portal which is free of cost. Only after registration, the vendor(s) can submit his/their bids electronically. Electronic Bidding for submission of Techno-Commercial Bid as well as Price Bid over the internet will be done. The Vendor should posses Class III signing type Digital Signature Certificate. Vendors are to make their own arrangement for bidding from a PC connected with Internet. MSTC is not responsible for making such arrangement. (Bids will not be recorded without Digital Signature).

SPECIAL NOTE: THE PRICE BID AND THE COMMERCIAL BID HAS TO BE SUBMITTED ON-LINE AT **www.mstcecommerce.com/eprochome/aycl**

1) **Vendors are required to register themselves online with** www.mstcecommerce.com**→ e-Procurement → PSU / Govt. depts. → Register as Vendor under AYCL- Filling up details and creating own user id and password → Submit**.

2) **Vendors will receive a system generated mail confirming their registration in their email which has been provided during filling the registration form.**

In case of any clarification, please contact MSTC/AYCL (before the scheduled time of the e-Tender).

Contact person (ANDREW YULE & COMPANY LTD):

1. **Mr. Sourav Sen Gupta**
   Sr Manager (Projects.)
   pradip.majumder@andrewyule.com

Cell : +91 98308-53319
Phone : +91(33) 2582 5734; +91(33) 2582 8279
Fax : +91(33) 2582 8581

2. **Mr. Gourab Banerjee**
   Asst. Manager – Materials
   gourab.banerjee@andrewyule.com
   Cell- 9674037162

Phone : +91(33) 2582 5734; Fax: +91(33) 2582 8279

Contact person (E-Commerce, MSTC Ltd):

1. Mr. Arindam Bhattacharjee
Deputy. Manager (E-commerce)
Mobile No: 09330102643
Email: arindam@mstcindia.co.in

2) Mr. Sabyasachi Mukherjee
Assistant Manager (E-commerce)
Mobile- 07278030407
Email: smukherjee@mstcindia.co.in

Landline: (033) 22901004

3. Ms Sumona Maity
Management Trainee (E-Commerce)
Mobile-09831155225
Email: smaity@mstcindia.co.in

System Requirement:

i) **Windows XP-SP3 or above / Windows 7 Operating System**

ii) **IE-7 or above Internet browser.**

iii) **Signing & Encryption type digital signature**

iv) **JRE 7 updates 79 software to be downloaded and installed in the system. Security level should be medium**

v) **To enable ALL active X controls and disable 'use pop up blocker' under Tools → Internet Options → custom level** (Please run IE settings from the page www.mstcecommerce.com once)

2. Part-I: Submission of EMD, Tender Fee & Filled up General Information Form (Annexure – II) - in sealed envelope to DGM (Materials), KW, AYCL:

Bidder may request for exemption from submitting EMD (Refer details given in Sl No 1 of Annexure-IV, General terms & condition).
Tender Fee – Rs. 5,000/- (Five Thousand only- Non refundable) to be paid by D.D. favouring Andrew Yule &Co Ltd, payable at Kolkata.

Earnest Money as per amount mentioned in Annexure-VII to be paid by DD favouring Andrew Yule & Co. Ltd. Payable at Kolkata

General information, under Annexure-II complete in all respect along with desired document.

In case of failure to submit the EMD within the stipulated time, the Tender may be rejected.

<u>Part-II</u>: Online Bid Submission: After proper submission of EMD and Tender Fee at Andrew Yule & Co, the prospective bidder to submit online Techno commercial and price bid through MSTC portal.

Following documents are to be uploaded at the E-Tender Portal as a credential of the prospective bidder:

3. Present Customer List.
4. Copies of purchase Orders & Performance Certificate from at least one reputed Organizations for having supplied same materials and provided same service during the year 2014-2015/2015-2016.Offers received without copies of performance certificate will/may be rejected.
5. Balance sheets and P&L Account. (2014-2015, 2015-2016 & 2016-17).

<u>Bidding in e-Tender</u>:

a. No interest will be paid on EMD. EMD of the unsuccessful bidder(s) will be refunded by ANDREW YULE & COMPANY LTD.EMD to be paid along with the Document within the last date as mentioned in SOT.

b. The process involves Electronic Bidding for submission of Techno Commercial Bid as well as Price Bid.

c. The bidder(s) who have submitted the EMD & Tender Fee to Andrew Yule can submit their Techno Commercial Bids and Price Bid through internet in MSTC website <u>www.mstcecommerce.com</u>→ e-procurement → PSU / Govt depts. → Login under AYCL→ My Menu → Auction Floor Manager → live event → Selection of the live event.

d. The bidder should allow to run an application namely enApple by accepting the risk and clicking on run. This exercise has to be done twice immediately after opening of Bid floor. Then they have to fill up Common terms /Commercial specification and save the same. After that clicking on the Techno-Commercial bid, if this application is not run then the bidder will not be able to save / submit his Techno-Commercial bid.

e. After filling the Techno-Commercial Bid, bidder should click 'save' for recording their Techno-Commercial bid. Once the same is done, the Price Bid link becomes active and the same has to filled up and then bidder should click on "**Save**" to record their Price Bid. Then once both the Techno-Commercial bid & Price Bid has been saved, the bidder can click on the "**Submit**" button to register their bid.

f. Vendors are instructed to use link in **My Menu** to ***Upload Documents*** in document library. Multiple documents can be uploaded. Maximum size of single document for upload is 5 MB.

g. Once documents are uploaded in the library, vendors can attach documents through *Attach Document* link against the particular tender. For further assistance please follow instructions of vendor guide.

h. In all cases, bidder should use their own ID and Password along with Digital Signature at the time of submission of their bid.

i During the entire e-tender process, the bidders will remain completely anonymous to one another and also to everybody else.

j. The e-tender floor shall remain open from the pre-announced date & time and for as much duration as mentioned above.

k. Techno-Commercial bid will be opened electronically on specified date and time as given in the NIT. Bidder(s) can download Technical Comparative statement.

i. Price bid will be opened electronically on specified date and time given in the NIT. Bidder(s) can download Price Comparative statement.

m. All entries in the tender should be entered in online Technical & Commercial Formats without any ambiguity.

n All electronic bids submitted during the e-tender process shall be legally binding on the bidder. Any bid will be considered as the valid bid offered by that bidder and acceptance of the same by the Buyer will form a binding contract between Buyer and the Bidder for execution of supply. Such successful tenderer shall be called hereafter **SUPPLIER**.

o It is mandatory that all the bids are submitted with Digital Signature Certificate otherwise the same will not be accepted by the system.

p Buyer reserves the right to cancel or reject or accept or withdraw or extend the tender in full or part as the case may be without assigning any reason thereof.

q. No deviation of the terms and conditions of the tender document is acceptable. Submission of bid in the e-tender floor by any bidder confirms his acceptance of terms & conditions for the tender.

r. Unit of Measure (UOM) is indicated in the e-tender Floor. Rate to be quoted should be in Indian Rupee as per UOM indicated in the e-tender floor/tender document.

E-tender cannot be accessed after the due date and time mentioned in NIT.

All notices / corrigendum and correspondence to the bidder(s) shall be sent by email only during the process till finalization of tender by ANDREW YULE& COMPANY LTD/MSTC LTD. Hence the bidders are required to ensure that their corporate email I.D. provided is valid and updated at the

stage of registration of vendor with MSTC. Bidders are also requested to ensure validity of their DSC (Digital Signature Certificate).

Any order resulting from this open e-tender shall be governed by the terms and conditions mentioned therein.

No deviation to the technical and commercial terms & conditions are allowed.

ANDREW YULE & COMPANY LTD has the right to cancel this e-Tender without assigning any reason thereof.

The online tender should be submitted strictly as per the terms and conditions and procedures laid down in the website www.mstcecommerce.com/eprochome/aycl of MSTC Ltd.

The bidders must upload all the documents required as per terms of NIT. Any other document uploaded which is not required as per the terms of the NIT shall not be considered.

The bid will be evaluated based on the filled-in technical & commercial formats.

Bidders are requested to read the vendor guide and see the video in the page www.mstcecommerce.com/eprochome/mstc of MSTC Ltd. to familiarize them with the system before bidding.

Annexure-II

ANDREW YULE & COMPANY LIMITED
Kalyani Works, Engineering Division

General Information

Tender ref.: AYCL/ENGG/MSD/SSG/HV Motor/18 Dated: 23/12/2017
Ref (This document should be dully filled up and attached along with EMD)

The applicants are required to furnish full information to the queries included in this form. In giving the particulars, the supporting documents/certificates as called for per queries at places, must be tagged with the application for evidencing the information furnished in the application.

1. Name of the firm in full :

2. Address, Telephone No.,
   Fax No. & E-mail :
   a) Address :
   b) Telephone No. :
   c) Fax No. :
   d) E-mail ID :
   e)Name of contact person :

3. Status of the company (Limited / Pvt. Ltd / Proprietary /partnership/ Reg. /Non-Reg. and date of inception:

4. Trade License No.
(Please attach a photo Copy of the license) :

5. Service Tax Registration No.
(Please enclose photocopy of Reg.)

6. Banker's name
   (a) Name of the Bank :

   (b) Name& address of the Branch :

   (c) Account No. :

Note: A copy of Banker's Certificate to be attached.

7. GST No.

8. I. T. Permanent Account No. & assessed up to (latest clearance Certificate to be attached):

9. Turnover in last three financial years (Audited Balance Sheet and P & L Account to be submitted):

10. Name of present customers (Photocopy of few contracts may be enclosed):

11. Details of EMD (DD Details) submitted:

12. Details of Tender Fee (DD Details) submitted:

I/we hereby certify that the particulars furnished by me/us above are true to the best of my / our knowledge and belief and mis-representations of facts will render me/us liable to my/our action as may be deemed fit by Andrew Yule & Co. Ltd. (Engineering Division) & have the sole discretion to reject or accept my/our candidature.

(Signature of the Applicant)
Office Stamp/Seal.

Place :

Date ;

List of Enclosures:

TECHNO-COMMERCIAL TERMS
(***To be filled online in MSTC portal***).

SL NO	TERMS & CONDITIONS
1	Delivery period/Lead time: Within 90 Days from the date of order placement/drawing approval as applicable.
2	GST no: Pls. mention with registration No., if any
3	Negotiated L1 price may be offered to other bidders whose price bid was opened. Andrew Yule reserves the right to order the entire Tender quantity on the L1 bidder.
4	Risk purchase clause: The company reserve the right to impose risk purchase clause as " For delay in execution / supply we shall have every right to do the same through some other agency/s which shall deemed fit and the additional cost of the same (Incidental/Consequential) shall be to your account which with respect to our intimation or observation whatsoever. Please confirm acceptance.
5	Liquidated damage - If the delivery is delayed beyond the date of scheduled date of execution in the order, penalty will be levied @ 1/2% per week subject to a maximum of 5% . Please confirm acceptance.
6	Legal condition(Arbitration): Any contract entered against this tender will be as per the following legal condition- It is recorded that this purchase order / contract / agreement is executed and concluded by and between the parties hereto at premises Engineering Division, Kalyani Works Plot -16 A & B, Block-D, Kalyani, Nadia, PIN-741235, West Bengal. In the event of any dispute arises out of this agreement between the parties only the appropriate Civil Court in the City of Kolkata shall have the exclusive jurisdiction to entertain, try and determine the said proceedings in exclusion of all other courts. Please confirm acceptance"-.
7	Validity of offer: Your price should be valid for acceptance till completion of complete supply/service, No price escalation will be entertained during that period
8	Price Basis , P&F :The price quoted should be FOR Kalyani Works. and will remain valid , firm & fixed till completion of supply, installation and commissioning of the items. no price variation will be allowed at any circumstances.
9	PAYMENT TERMS: - within 90 days of receipt of the items at site (duly received.)
10	Guarantee /Warrantee Clause: The workmanship/smooth operation of the plant with respect to supply is to be guaranteed for a period of 18 months from the date of supply.
11	Inspection: Inspection will be done by us/client at your works. Final inspection may be done, if required by us/client at site after receipt of the materials/installation of the item by you. Vendor to submit QAP for approval.
12	Codes and Standards: All equipment and materials to be furnished under this specification shall be designed, manufactured and tested in accordance with the latest revisions of the relevant Indian

	Standard(IS) as applicable. The work shall be done in compliance with the IS Specification.
13	**Force Majeure Clause:** 1. Force Majeure 1.1 Neither vendor nor AYCL shall be liable to the other for any delay or non-performance of its obligations under this **Contract** arising from any cause beyond its reasonable control including in relation to either Party any act of God, governmental act, act of any regulatory authority, supervening illegality, war, fire, flood, explosion, power blackout, break-down of machinery, loss of utility, civil commotion, industrial dispute, manpower unrest acts or omissions of telecommunications or data communications operators or carriers , in relation to vendor (to the extent not directly attributable to vendor's negligence), (a "**Force Majeure Event**").The affected Party shall promptly notify the other Party in writing, of the cause and the Force Majeure Event and its likely duration within no later than two (2) days after the affected Party knew of the occurrence of the Force Majeure Event. Performance by the affected Party of its obligations **under this Contract** shall be suspended for the duration of the Force Majeure Event. If performance is not resumed within 15 (fifteen) days after theForce Majeure Event, either Party may terminate this **Contract** by giving to the other Party seven (7) days' notice in advance. 1.2 On the occurrence of any Force Majeure Event, the affected Party shall use all reasonable efforts (including emergency fixes and workarounds) to perform its obligations **under this Contract** during the period of suspension. Further the affected Party shall perform such part of its obligations pursuant to this Contract as are not affected by the Force Majeure Event. 1.3 The affected Party shall use its reasonable efforts to mitigate the effect of any event of Force Majeure as soon as practicable.
14	**Others if any.**

GENERAL TERMS AND CONDITIONS

1. **EMD**: to be paid , by way of Demand Draft drawn in favor of M/S ANDREW YULE & CO.LTD Payable at Kolkata to be submitted.

   For bidders already enlisted with AYCL- Kalyani Works, having outstanding amount more than the EMD amount or who have already submitted the EMD against our earlier tenders or those who have security deposit with Andrew Yule may apply for adjustment of the same.

   Bidders who are MSME units may apply for exemption from furnishing EMD by making a specific request in writing and enclosing the necessary document in support of the same**.**

   Bidders whose turnover is more than Rs: 50 crores may apply for exemption from furnishing EMD by making a specific request in writing and enclosing the necessary document in support of the same

   If reason for non-submission of EMD or adjustment against the outstanding balance for EMD is not mentioned in Techno-commercial bid of tender, the tender will be rejected.
   New vendors are required to submit all credentials for enlistment /competency

2. Bidder should submit copies of purchase orders & Performance Certificate from at least two reputed Organizations for providing/supply of similar items during the year last three years.. Offers received without copies of performance certificate may be rejected.

3. Bidders should enclose copy of last 3 years Balance sheets and P&L Account. (2014-2015, 2015-2016, 2016-2017).

4. Bidders should enclose a DD for Rs: 5,000 /= in favor of ANDREW YULE & CO.LTD, Payable at Kolkata towards cost of tender document.

5. THE RIGHTS OF THE COMPANY

The company reserves the right to reject any tenderer based on their past performance

6. The breakup of your quoted rate with respect to supply and supervision service to be submitted along with Price bid.

Requirement of High Voltage AC Motor & its mandatory spares as per details.
Details :-

1) 1050KW , 6P , 6.6 KV Foot Mounted Flame proof (Hazardous Application Zone-2 IIC, T4) VFD compatible squirrel Cage Induction Motor Extd type.- 1 set

2) Necessary spares:- (for above motor)

Cooling Fan- one No
Terminal Bushings:- Three Nos
Bearings (DE+NDE):- one set
BTD (DE+ NDE):- one set

TECHNICAL SPECIFICATION
FOR
HIGH VOLTAGE
INDUCTION MOTOR

Abbreviations:

BIS	:	Bureau of Indian Standard
BS	:	British Standards
CIMFR	:	Central Institute of Mines and Fuel Research
CT	:	Current Transformer
EIL	:	Engineers India Limited
FM	:	Factory Mutual
FRP	:	Fiber Reinforced Polyester
IEC	:	International Electro-technical Commission
IEEE	:	Institute of Electrical & Electronics Engineers
IS	:	Indian Standard
JEC	:	Japanese Electro-technical Committee
LCIE	:	Laboratoire Central des Industries Electriques
LRWT	:	Locked Rotor Withstand Time
NEMA	:	National Electrical Manufacturers Association
PO	:	Purchase Order
PVC	:	Poly Vinyl Chloride
p.u.	:	per unit
r.m.s	:	Root Mean Square
RPM	:	Revolutions per Minute
TETV	:	Totally enclosed Tube Ventilated
UL	:	Underwriter's Laboratories
VDE	:	Verband Deutscher Elektrotechniker

CONTENTS

1.0 SCOPE

This specification covers the design, manufacture, testing, packing and supply of high voltage squirrel cage induction motors.

2.0 CODES AND STANDARDS

The squirrel cage induction motors and their components shall comply with the latest editions of following standards issued by BIS (Bureau of Indian Standards) unless otherwise specified:

IS-5	:	Colours for ready mixed paints and enamels
IS-325	:	Three phase induction motors
IS-1271	:	Thermal evaluation and classification of electrical insulation
IS-2071	:	Methods of high voltage testing
IS-2148	:	Flameproof enclosures of electrical apparatus
IS-2253	:	Designation for type & construction and mounting arrangement of rotating electrical machines
IS-2968	:	Dimensions of slide rails for electrical motors
IS-4029	:	Guide for testing of three phase induction motors
IS-4691	:	Degree of protection provided by enclosure for rotating electrical machinery
IS-4722	:	Rotating electrical machines
IS-4728	:	Terminal marking and direction of rotation for rotating electrical machinery
IS-4889	:	Method of determination of efficiency of rotating electrical machines
IS-6362	:	Designation of methods of cooling of rotating electrical machines
IS-6381	:	Construction and testing of electrical apparatus with type of protection e
IS-7389	:	Pressurized enclosure of electrical equipment for use in hazardous areas
IS-7816	:	Guide for testing insulation resistance of rotating machines
IS-8223	:	Dimensions and output series for rotating electrical machines
IS-8289	:	Electrical equipment with type of protection n
IS-8789	:	Values of performance characteristics for three phase induction motors
IS-9628	:	Three phase induction motors with type of protection n
IS-12065	:	Permissible limits of noise level for rotating Electrical Machines
IS-12075	:	Mechanical vibration of Rotating Electrical Machines with shaft heights 56 mm and higher measurement, evaluation and limits of vibration severity

IS-12802	:	Temperature rise measurement of Rotating Electrical Machines
IS-12824	:	Type of duty and classes of rating assigned to rotating electrical machines
IS-13529	:	Guide on effects of unbalanced voltages on the performance of three phase induction motors
IS-13555	:	Guide for selection and application of three phase induction motors for different types of driven equipments
IS-14222	:	Impulse voltage withstands levels of rotating electrical machines with form-wound stator coils
IS-14568	:	Dimension and output series for rotating electrical machines, frame numbers 355 to 1000 and flange numbers 1180 to 2360

2.1 In case of imported motors, standards of the country of origin shall be applicable if these standards are equivalent or stringent than the applicable Indian Standards.

2.2 The motors shall also conform to the provisions of Indian Electricity rules and other statutory regulations currently in force in the country.

2.3 In case Indian Standards are not available, standards issued by IEC/BS/VDE/IEEE/ NEMA or equivalent agency shall be applicable.

2.4 In case of any contradiction between various referred standards/ specification/ data sheets and statutory regulations, the following order of priority shall govern.

- Statutory regulations
- Data Sheets
- Job specifications
- This specification
- Codes and standards

All conflicts between the requirements of this specification & other relevant documents shall be referred to principal for resolution.

3.0 GENERAL REQUIREMENTS

3.1 The offered equipment shall be brand new with state of the art technology and proven field track record. No prototype equipment shall be offered.

3.2 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment at least for 15 years from the date of supply.

3.3 Vendor shall give a notice of at least one year to the end user of equipment and PMC before phasing out the product/spares to enable the end user for placement of order for spares and services.

4.0 OPERATING CONDITIONS

4.1 Ambient Conditions

Motors shall be suitable for operating satisfactorily in humid and corrosive atmospheres found in refineries, fertilizer, petrochemical and metallurgical plants. Service conditions shall be as specified in the data sheet. If not specifically mentioned therein, a design ambient temperature of 48^0C and an altitude not exceeding 1000 meters above mean sea level shall be taken into consideration.

4.2 Frequency and Voltage variations.

Unless otherwise agreed, motors shall be designed for continuous operation at rated output under the following conditions:

a. The terminal voltage differing from its rated value by not more than ± 6 % or
b. The frequency differing from its rated value by not more than ±3%.
c. Any combination of (a) and (b)

4.3 Starting

a. Unless otherwise specified, motors shall be designed for direct on line starting.
b. Motors shall be designed for re-acceleration with full load after a momentary loss of voltage with the possibility of application of 100% of the rated voltage when the residual voltage has dropped down to 50% and is in phase opposition to the applied voltage.
c. Motors shall be designed to allow the minimum number of starts on full load indicated in Table below :

Min. Number of starts	Upto 500 KW	500 to 1000 KW	Above 1000 KW
No. of consecutive start-ups with initial temperature of the motor at ambient level (cold.)	3	3	2
No. of consecutive start-ups with initial temperature of the motor at full load operating level (hot)	2	2	1

d. Unless otherwise specified, the locked rotor withstand time under hot condition at 100% voltage (time tE for increased safety i.e. Ex e motor) shall be minimum 5 seconds more than the starting time at 100 % voltage, under specified load conditions.

4.4 Unless otherwise stated in the data sheet, motors shall be suitable for starting at 80% of the rated voltage against the torque speed characteristics of the driven equipment.

a. Starting torque and minimum torque of the motor shall be compatible with the speed torque characteristics of the driven equipment under specified starting and operating conditions.
b. For heavy duty drives such as blowers, crushers, compressors etc., high starting torque motors shall be provided.

This shall be checked against the speed torque characteristics of the load and the thermal withstand characteristics of the motors.

4.5 The pull out torque at rated voltage shall be not less than 175 percent of the rated load torque with no negative tolerance. In case of motors driving equipments with pulsating loads (e.g. reciprocating compressors), the minimum value of the pull out torque at 80% of rated voltage shall be more than the peak value of the pulsating torque and the current pulsation shall be limited to 40%.

Unless otherwise agreed, the pull out torque shall not exceed 300% of the rated load torque.

4.6 Direction of rotation

Motors shall preferably be suitable for either direction of rotation. In case unidirectional fan is provided for motors, direction of rotation for which the motor is designed shall be permanently indicated by means of an arrow. Any alteration required for obtaining a change in the direction of rotation such as reversal of the fan, must be clearly specified. Motors which are suitable for only one direction of rotation shall have this direction of rotation clearly indicated on the motor together with the phase sequence of the terminals associated with this rotation in indelible marking. Motors suitable for bi- directional rotation shall be provided with a double headed arrow. Directional arrow should be manufactured from corrosion resistant material.

Normally, clockwise rotation is desired as observed from the driving (coupling) end, when the terminals ABC are connected to a supply giving a terminal phase sequence in the order ABC. Counter clockwise rotation of the motor shall be obtained by connecting the supply to terminals so that the phase sequence corresponds to the reversed alphabetical sequence of the terminal letters. Ample space shall be provided at the terminal box for interchanging external leads C and A for this purpose.

5.0 PERFORMANCE

5.1 Motors shall be rated for continuous duty (S1), unless otherwise specified in the data sheet.

5.2 Motors shall have adequate torque to accelerate the load from zero to full speed under the specified starting and operating conditions.

5.3 Starting current shall be 500% subject to IS/IEC tolerance for motors up to 1000 kW. For motors above 1000 kW, it shall be agreed with purchaser for each case.

5.4 In particular cases, when the starting current is to be limited, care shall be taken such that the design values of torque meets the load requirement while at the same time complying with clause 4.3 above of this specification.

5.5 In particular cases, when the starting with reduced voltage is specified, care shall be taken such that the design values of torque meets the load requirement while at the same time complying with clause 4.4 and 4.5 above of this specification.

6.0 CONSTRUCTION DETAILS

6.1 Windings

6.1.1 Motors shall be provided with class-F insulation. The permissible temperature rise above the specified ambient temperature shall be limited to those specified in the applicable Indian Standards for class-B insulation.

6.1.2 The windings, along with the stator, shall be tropicalised and shall be vacuum impregnated.

Winding shall be adequately braced to prevent any relative movement during operation. In this respect, special care shall be taken for the stator windings of direct-on-line starting squirrel cage motors. Insulation shall be provided between coils of different phases which lie together.

6.1.3 Core laminations must be capable of withstanding burnout for rewind at 400^0C without damage or loosening.

In case of motors driving equipment with pulsating loads, special attention shall be paid to the joints of rotor bars and end rings to avoid premature failures due to induced fatigue stresses.

For Ex n and Ex e motors, the conductor insulation must be carried right up to the terminal clamp.

6.1.4 Windings shall be designed to withstand a coil surge voltage of 2.4 p.u. rated peak to line voltage.

6.1.5 Motors shall be designed to withstand impulse voltages specified in applicable Indian Standards. The wave shape shall be as per IS.

6.1.6 Windings of motors shall be star connected.

6.2 Terminals, terminal boxes and cable entries

6.2.1 The ends of the winding shall be brought out into a terminal box. The terminations shall be by means of bushings with adequately sized bolted

terminals. Line terminals shall be properly insulated from the frame with material resistant to tracking.

6.2.2 The terminal box shall be located on the right hand side viewed from the driving (coupling) end. Unless otherwise specified in the data sheet, the terminal box shall be suitable for bottom cable entry. The size of the cable end boxes shall be large enough to provide a minimum distance of 600 mm between cable gland plate and terminal lug.

6.2.3 The neutral point of the star windings shall also be brought out to a separate terminal box. This shall house the current transformers for differential protection of motors wherever required and shall be located on the opposite side of main terminal box.

6.2.4 The main and neutral terminal box shall be of fabricated sheet steel. The main terminal box shall be phase segregated type, unless otherwise agreed.

Motors can have elastimold phase insulated terminals in a common box. Ex d type (flame proot) and Ex p type (pressurized) motors can have phase insulated terminal box of matching Ex d/Ex p rating.

6.2.5 The terminal box must be of robust construction, with necessary clearance, creepage distances between live parts and between live parts to earth considering air insulation and without any compound filling.

6.2.6 The terminal box shall be capable of withstanding the fault current for a period of 0.25 seconds specified in the data sheet.

6.2.7 Appropriate phase markings as per IS shall be provided inside the terminal box. The markings shall be non-removable and indelible.

6.2.8 The terminal box shall be provided with entries for suitable cable glands corresponding to the size of the specified cables.

Equipment and accessories provided shall conform to the hazardous area classification and the environmental conditions as specified in the data sheet.

6.2.9 An adequately sized earth terminal shall be provided for cable armour termination. It is essential that all metal parts (mounting rail and cable glands) are bonded and connected to the earth system. Bonding straps are also required across joints on non-active parts.

6.2.10 Separate terminal boxes shall be provided for space heaters, resistance temperature detectors and vibration probes.

6.2.11 Main and neutral terminal box covers must be provided with handles to facilitate easy removal.

6.3 Motor casing and type of enclosure

6.3.1 Motors for use in hazardous areas (Zone-1 or Zone-2) shall have type of protection Ex d and shall meet the requirements of applicable Indian Standards.

6.3.2 All Motors shall be suitable for installation directly outdoor and must have degree of protection corresponding to IP-55 as per IS.

6.3.3 All internal and external metallic parts, which can come into contact with cooling air (Piping, air supply and discharge conduits, protective grills air deflectors, filters and supports etc.) shall be of corrosion resistant material or appropriately treated to resist corrosive agents which may be present in the atmosphere. Screws and bolts shall be of rust proof material or protected against corrosion.

6.3.4 Effective equipotential bonding straps to guard against the occurrence of sparks due to presence of circulating currents shall be provided in type Ex n, Ex e and Ex p motors.

6.4 Bearing and lubrication

6.4.1 Motors shall have grease lubricated ball or roller type bearings or of the manufacturer's standard type. However, 2 pole motors above 750 kW rating shall be provided with sleeve bearings as a minimum. Sleeve bearings when provided shall be of proven design.

6.4.2 The bearings shall be chosen to give a minimum L- 10 rating life of 5 yrs. (40,000 hrs) at rated operating conditions.

(The L -10 rating life is the number of hours at constant speed that 90 % of a group of identical bearings will complete or exceed before the first evidence of the failure).

6.4.3 Where bearing supports are attached to the motor casing adequate bracing shall be provided on these supports to reduce vibrations and ensure long life of the bearings. Bearings shall be adequate to absorb axial thrust in either direction produced by the motor itself or due to shaft expansion.

6.4.4 Motor bearings exposed to high temperatures (e.g. motors for hot oil/boiler feed pumps) shall have adequate provisions for cooling of bearings.

6.4.5 Vertical motors shall be provided with thrust bearings suitable for the load imposed by the driven equipment.

6.4.6 Motors shall be designed to permit removing/replacement of bearings.

6.4.7 Grease lubricated bearings

Bearings shall be capable of grease injection from outside without removal of covers. The bearing boxes shall be provided with labyrinth seals, to prevent loss of grease or entry of dust or moisture. When grease nipples are provided, these

shall be associated, where necessary, with appropriately located relief devices, which ensure passage of grease through the bearings.

The motors shall have facility for on-line greasing.

6.4.8 Sleeve bearings

Sleeve type bearings shall be fitted with oiler rings for continuous lubrication. The oil reservoirs shall have a form suitable for allowing settling of any solids or residual particles contained in the oil.

The covers shall be provided with suitable openings for adding and draining oil, together with an overflow plug and level indication. The shaft shall have perfect seals so as to prevent entry of dust or moisture.

6.4.9 Forced lubrication bearings

The oil lubrication system shall be independent of the driven machine. Common lubrication system for the driven equipment and the motor can be accepted provided it is separate from the seal oil system. The common lubrication system shall be provided with suitable degassing equipments to extract gas reducing the probability of gas entering the motor.

In the independent lubrication system, oil supply shall be guaranteed by one of the following methods:

- With a mechanical pump co-axial with the motor and supplemented by a separate electric motor driven pump for initial lubrication during start up and stopping operations.

- With a separate electric motor driven pump. In this case the lubricating system shall consist of two identical motor driven pumps, one running and one acting as standby.

In addition to the pumps, the lubrication system shall be supplied complete with the following as a minimum:

a. An oil cooler of shell and tube type with tubes of inhibited admiralty brass. Internal coolers shall not be accepted. To prevent the oil from being contaminated, if the cooler fails, the oil side operating pressure shall be higher than the water side operating pressure.

b. An austenitic stainless steel oil reservoir with the following characteristic :

   - The capacity to avoid frequent filling, to provide adequate allowance for system rundown and to provide a retention time of at least 3 minutes to settle Provision to eliminate air and minimize flotation of foreign matter to the pump suction
   - Fill connections, reflex type level indicators and breathers suitable for outdoor use

- Sloped bottoms and connections for complete drainage
- Clean out openings as large as is practicable
- A bypass line that returns below the oil level to eliminate aeration and static electricity
- A thermostat with two electrical contacts for alarm & tripping in case of high oil temperature

c. A supply and return system

d. A duplex full flow filter with replaceable elements and filtration of 25 µm nominal or finer as recommended by the bearing manufacturer. Filter cartridge material shall be corrosion resistant. Metal mesh or sintered metal filter elements shall not be acceptable. The filter shall not be equipped with a relief valve or an automatic bypass

e. The motor driven auxiliary pumps shall be provided with suction stainer and an automatic/manual control system arranged to start automatically on low oil pressure and with manual shutdown only

f. Sight flow indicators in each bearing drain line

g. Temperature gauges (with thermowells) in the reservoir, after the oil cooler and each bearing drain line

h. Low oil pressure alarm and shutdown switches

i. A pressure gauge (valved for removal) for each pressure level and a pressure differential indicator to measure filter pressure drop

j. Thermostatically controlled electric immersion heater with a sheath of austenitic stainless steel for heating the charge capacity of oil before start-up in cold weather. The heating device shall have sufficient capacity to heat the oil in the reservoir from the specified minimum site ambient temperature to the start-up temperature, as required by the manufacturer, within 12 hours. The watt density of heater shall not exceed 2.33 watts per sq. mm.

k. The oil pumps shall have steel casings unless they are enclosed in a reservoir.

All other oil containing pressure components shall be steel.

A control panel shall be provided for operation & control of the lubrication system. The control panel shall include fuses, electrical contactors and thermal relays for the protection and operation of the motor driven pumps, push-buttons, auxiliary relays and timer relays for the automatic and manual starting up and shutting down of the oil pump.

Equipment and accessories provided shall conform to the hazardous area and the environmental conditions specified in the data sheet.

Armoured cables suitable for high temperature duty shall be used for external electrical connections between the control panel and the lubrication system.

6.4.10 Bearing Insulation-Shaft Voltage

Induced voltage at the shaft end of the motor at no load shall not exceed 250 mV r.m.s. for roller and ball bearings and 400 mV r.m.s. for sleeve bearings. The non driving end bearing shall be insulated from the motor frame to avoid circulating current.

The insulated bearing end shield or pedestal shall bear a prominent warning and manufacturer shall provide detailed drawings showing insulation arrangement.

6.5 Cooling System

All motors shall preferably be self-ventilated. Motors with higher outputs having manufacturer's standard designs using forced ventilation cooling or closed circuit cooling employing external coolants may also be considered.

6.5.1 Self Ventilated Motors

All motors shall be fan cooled. The fans shall be of corrosion resistant material and appropriately protected. The material of fan for motors to be used in hazardous areas shall be anti- static and non-sparking type.

Motors for installation in dusty atmospheres or in the presence of sand, fuels or other suspended solid particles in the air shall be fitted with filters for the cooling air. The filters shall be easily accessible for inspection and removable for cleaning and re-use. The material of the filters and supports trays shall be rust proof or protected against oxidation or corrosion.

6.5.2 Motors with forced ventilation

Motors with forced ventilation shall be equipped with two motor driven fans each capable of supplying the full quantity of cooling air required by the motor at full load.

Where air cooler design permits provision of one fan only; the second fan shall be supplied loose. Cooler design shall allow easy replacement of fan in such case.

The ventilating system shall include the flanges for the air intake and the mating flanges for the discharge ducts. An airflow indicator as described in paragraph 7.3 (a) shall also be provided.

Motors and fans used for forced ventilation shall conform to the hazardous area classification and environmental conditions specified in the data sheet.

6.5.3 Motors with closed circuit cooling with air to air heat exchangers

The heat exchanger tubes shall be of steel or extruded aluminium. All exposed surfaces of the heat exchanger and of the motors shall be safeguarded against corrosion by immersion in varnish followed by baking.

Joints between the heat exchanger and the main body of the motor shall be sealed by weather-proof gaskets.

Filters shall be provided to prevent the ingress of dust and foreign particles. These shall be easily accessible for cleaning and replacement.

6.6 Rotor

The rotor shall be of squirrel cage type, dynamically balanced to provide a low vibration level and a long service life to the bearings. The accepted values of vibrations for a motor at rated voltage and speed shall not exceed those given in the IS. The shaft ends shall be provided with suitably threaded hole or holes to facilitate the assembly or removal of couplings and bearing races.

6.7 Shaft extension

Motors shall be provided with a single, bare shaft extension with key way and key. Motor shaft shall be sized to withstand 10 times the rated design torque.

6.8 Lifting hooks

All motors shall be provided with lifting facility (i.e. hooks etc.) of adequate capacity. For motors provided with heat exchangers, lifting facility shall also be provided for the heat exchanger.

6.9 Earth terminals

Two earth terminals shall be provided on the frame of each motor at diametrically opposite points. Minimum size of the stud shall be 12 mm. Necessary nuts and spring washers shall be provided for earth connection. These earth terminals shall be in addition to the earth terminals provided in the terminal box for earthing of the armour.

7.0 CONTROL, ALARM AND TRIP DEVICES

All electrical contacts for the devices described below (e.g. at sections 7.3 & 7.4) shall have a current carrying capacity not lower than 5 A and a minimum interrupting capacity of 1 A at 220 V DC or 5 A at 240 V AC.

The contacts shall be located in explosion proof or totally sealed housing according to the type of motor enclosure. The cable ends shall be brought together to the terminal box. Any external connections between the housing containing the relay contacts and the terminal box shall be carried out by insulated copper wires in steel conduits or by PVC insulated, armoured, copper conductor cables with cable entries through double compression type cable glands.

7.1 Measurement of winding temperature

Motors with outputs greater than 750 KW or those provided with filters for cooling air irrespective of output shall be provided with platinum resistance temperature measuring devices of 100 ohms resistance at 0^0c and a temperature co-efficient of 3.85 x 10^{-J} located in suitable positions to measure the winding temperature. A minimum of three (one per phase) detectors shall be provided between the coil sides to measure the winding temperature and three (one per phase), preferably at the base of the slots, to measure core temperature, each placed 120^0 apart. TETV motors may not be provided with core temperature detectors.

A separate terminal box shall be provided for the temperature detectors for hook up with a remote located control I monitoring unit.

7.2 Measurement of bearing temperature

Motors with sleeve type self-lubricated bearing shall be provided with :

a. Two mercury bulb type, indicating dial thermometers for checking of bearing temperatures.

b. For motors with output greater than 750 KW, a resistance type of temperature measuring device shall be provided for bearings with connections terminating in the terminal box.

7.3 Measurement of cooling medium for heat exchangers

Motors with forced ventilation and those with air water heat exchangers shall be provided with:

a. An airflow circulation indicator with electrical trip contacts that operate if the flow of cooling air is interrupted or is inadequate.

b. A cooling water flow circulation indicator with electrical trip contacts, which close if the flow of cooling water is interrupted or is inadequate. The indicator shall be located on the discharge piping of the heat exchanger.

8.0 MISCELLANEOUS ACCESSORIES

8.1 Current transformers

Unless otherwise specified, motors rated 1500 KW and above shall have differential protection and shall be equipped with current transformers suitably designed for installation in the neutral terminal box.

Unless otherwise specified, the CTs shall be supplied along with the motor and mounted in the terminal box, which shall be suitable for housing the CTs and providing the necessary connections. CT terminals shall be brought out to a separate auxiliary terminal box.

These transformers shall have a secondary current of 1 A, and the characteristics of the CTs (Vk, ReT and Im) shall be finalized at detailed engineering stage in consultation with the purchaser.

CT ratio shall be as indicated in the data sheet.

8.2 Anti condensation heaters

All motors shall be provided with 240 V anti-condensation heaters, sized and located so as to prevent condensation of moisture during shut down periods. The heaters shall remain 'ON' when the motor is not in service and shall not cause damage to the windings.

Motors with heaters installed in hazardous atmospheres (Zone-1 or Zone-2), shall conform to the provisions of applicable Indian standards and temperature classification specified in the data sheet.

The heater leads shall be brought out to a separate terminal box of the same specification and grade of protection as the main power terminal box.

A warning label with indelible red inscription shall be provided on the motor to indicate that the heater supply shall be isolated before carrying out any work on the motor.

8.3 Special tools and spanners

Motors with special features (e.g. motors with single bearing, explosion proof and increased safety motors) shall be provided with a set of spanners and special tools, required for dismantling and maintenance of the motor.

8.4 Motors shall be supplied complete with double compression Nickel plated brass (or Aluminium, if specifically required) cable glands, crimp type tinned Cu cable lugs for all power, space heater and auxiliary cables (for the specified cable sizes) and first filling of lube oil for forced lubricated bearings.

8.5 Auxiliary motors, if any, shall be as per relevant Indian/ International standards and shall be suitable for the hazardous classification as specified in the data sheet.

8.6 Name Plates

A stainless steel name plate manufactured from series 300 stainless steel and having information as per IS shall be embossed provided on each motor. In addition to the motor rating plate, a separate number plate for motor tag number shall be fixed in a readily visible position. This number shall be as per the data sheets.

Additional information as stipulated in applicable Standards shall be included in the name plate for motors meant for use in hazardous atmospheres.

9.0 NOISE LEVEL

The permissible noise level shall not exceed the stipulations laid down in IS.

10.0 MOTOR VIBRATION

Motor vibrations at bearing housing shall be within the limits of IS, unless otherwise specified for the driven equipment. Limits of shaft vibration for motors with sleeve bearings shall be as per IEC-60034-14.

Two and four pole motors having sleeve bearings with forced oil lubrication shall be provided with proximity probes to measure the shaft vibration adjacent and relative to the bearings.

11.0 CRITICAL SPEEDS

The first actual critical speed of stiff rotors shall not be lower than 125% of the synchronous speed. For flexible rotors, this shall be between 60% and 80% of the synchronous speed. The second actual synchronous speed shall be above 125% of the synchronous speed.

12.0 AUTO CHANGEOVER REQUIREMENT

i) When power supply to the group of Motors connected to a particular bus is disconnected, the bus voltage starts decaying in magnitude and the angular displacement with respect to the standby (Incoming) bus voltage starts increasing. The decay and angular displacement is dependent on the combined behavior of all the motors and their inertias. Some motors having a higher inertia (fans) tend to behave as generators and supply power to those having lower inertia (pumps). It can be seen that, the faster the changeover, the lesser would be the magnitude decay and angular displacement. Consequently the voltage appearing on motor terminals at the instant changeover is effected would be less.

ii) From this point, it would be desirable to have a fast auto changeover. The time interval with this scheme will be the difference between the closing and tripping times of the breakers (around 3 to 4 cycles).

iii) It should be specified that motors should withstand the forces arising out of changeover. It has been observed that 150% voltage can be considered for the purpose.

13.0 PAINTING

Internal and external parts of the casing and all metal parts likely to come in contact with the surrounding air shall be protected with anti-acid paint that shall resist the particular ambient condition.

All external surfaces shall be given a coat of epoxy based paint. Paint shade shall be 632 as per Indian Standard IS-5.

14.0 INSPECTION AND TESTING

14.1 During manufacturing of motors, the motors shall be subject to inspection by PMC/Owner's Inspector or by an agency authorized by the Owner. The manufacturer shall provide all necessary information concerning the supply to PMC/Owner's Inspector.

14.2 All the type, routine and other acceptance tests shall be witnessed by the Inspector. The manufacturer shall give prior notice of minimum 4 weeks to the Inspector for witnessing the tests.

14.3 All the type tests, routine tests and acceptance tests shall be carried out at manufacturer's shop.

All these tests shall be carried out under manufacturer's care and at his expense.

14.4 Tests certificates duly signed by the PMC/Owner's Inspector shall be a part of final documentation.

14.5 The manufacturer shall submit all internal test records of the tests carried out by him on the bought-out items, motor sub-assembly and complete motor assembly to the Inspector before offering the motors for final inspection and testing.

14.6 The following type tests shall be carried out as per applicable Indian Standards and shall form part of acceptance testing :

a. Full load test and measurement of voltage, current, power & slip
b. Measurement of starting torque, starting current, full load torque and pull out torque
c. Measurement of efficiency and p.f. at 100%, 75% and 50% load
d. Temperature rise test
e. Momentary overload test
f. Tan delta test
g. Measurement of noise level
h. Measurement of vibration
i. Over speed test
j. Measurement of radial & axial clearance between fan & stationary parts
k. Measurement of radial air gap
l. Measurement of resistance of space heater, RTDs & BTDs
m. Polarization index test
n. Measurement of surface temperature of frame & space heater

14.7 Routine tests shall be carried out on all motors.

The manufacturer shall carry out routine tests as per applicable Indian Standards. Routine tests not limited to the following shall form part of acceptance testing:

a. General visual checks, name plate details, mounting, terminal box location and cable gland sizes
b. Measurement of shaft centre height dimensions
c. Measurement of clearances in the terminal box
d. Verification of direction of rotation
e. Verification of cooling system & lubrication system
f. Measurement of winding resistance
g. Insulation resistance test (before & after high voltage test)
h. High voltage test
i. No load test and measurement of voltage, speed, current & power input
j. Locked rotor test at reduced voltage and measurement of voltage, current &power input
k. Reduced voltage starting & running
l. Measurement of shaft voltages
m. Tests on the Ex d enclosures as per IS

14.8 The manufacturer shall submit the following certificates for verification by the PMC/Owner's Inspector:

a. Test certificate for degree of protection of enclosure
b. Short circuit test for terminal box
c. Impulse test certificate
d. Test certificates issued by the recognized independent test house for hazardous area motors
e. Approval certificates issued by Statutory Authorities for hazardous area motors
f. BIS license and marking as required by Statutory Authorities for Ex-d motors
g. Hydraulic test certificate for coolers

14.9 In case any of the Type & Routine tests mentioned above cannot be carried out due to manufacturer's test bed limitations etc., alternatively calculations to establish the required parameters as per International codes eg IEC, JEC etc. may be accepted which shall be furnished to attending inspector.

14.10 Though the motors shall be accepted on the basis of the satisfactory result of the testing at the shop, it shall not absolve the Vendor from liability regarding the proper functioning of the motors coupled to the driven equipment at site.

15.0 CERTIFICATION

The motors and associated equipment shall have test certificates issued by recognized independent test house (CIMFR/ Baseefa/ LCIE/ ULIFM or equivalent). All indigenous motors shall conform to Indian Standards and shall be certified by Indian testing agencies. All motors (indigenous and imported) shall also have valid statutory approvals as applicable for the specified location.

All indigenous flameproof motors shall have valid BIS license & marking as required by statutory authorities.

16.0 PACKING AND DESPATCH

All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by ship/rail or trailer. The equipment shall be wrapped in polythene sheets before being placed in crates/ cases to prevent damage to finish. Crates/cases shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up', 'Centre of gravity' , 'Weight', 'Owner's particulars', 'PO Nos.' etc. shall be clearly marked on the package together with other details as per purchaser order.

The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.

17.0 DOCUMENTATION & DRAWINGS

The following drawings and data shall be submitted for all machines.

- Outline drawings showing main dimensions, arrangement of components, terminal boxes, foundation loading.
- Schematic and connection diagrams covering all equipment pertaining to the motor.
- Additional information shall be provided for HV motors over 250 KW as follows:
- Torque-speed curves.
- Bearing arrangement/ alignment drawing with data outlining bearing/ bearing shell replacement procedure.

18.0 TEST REPORT

The manufacturer shall provide test reports giving the results of all tests carried out on the machines supplied. These reports shall also include the manufacturers type tests and routine/ production tests, if applicable.